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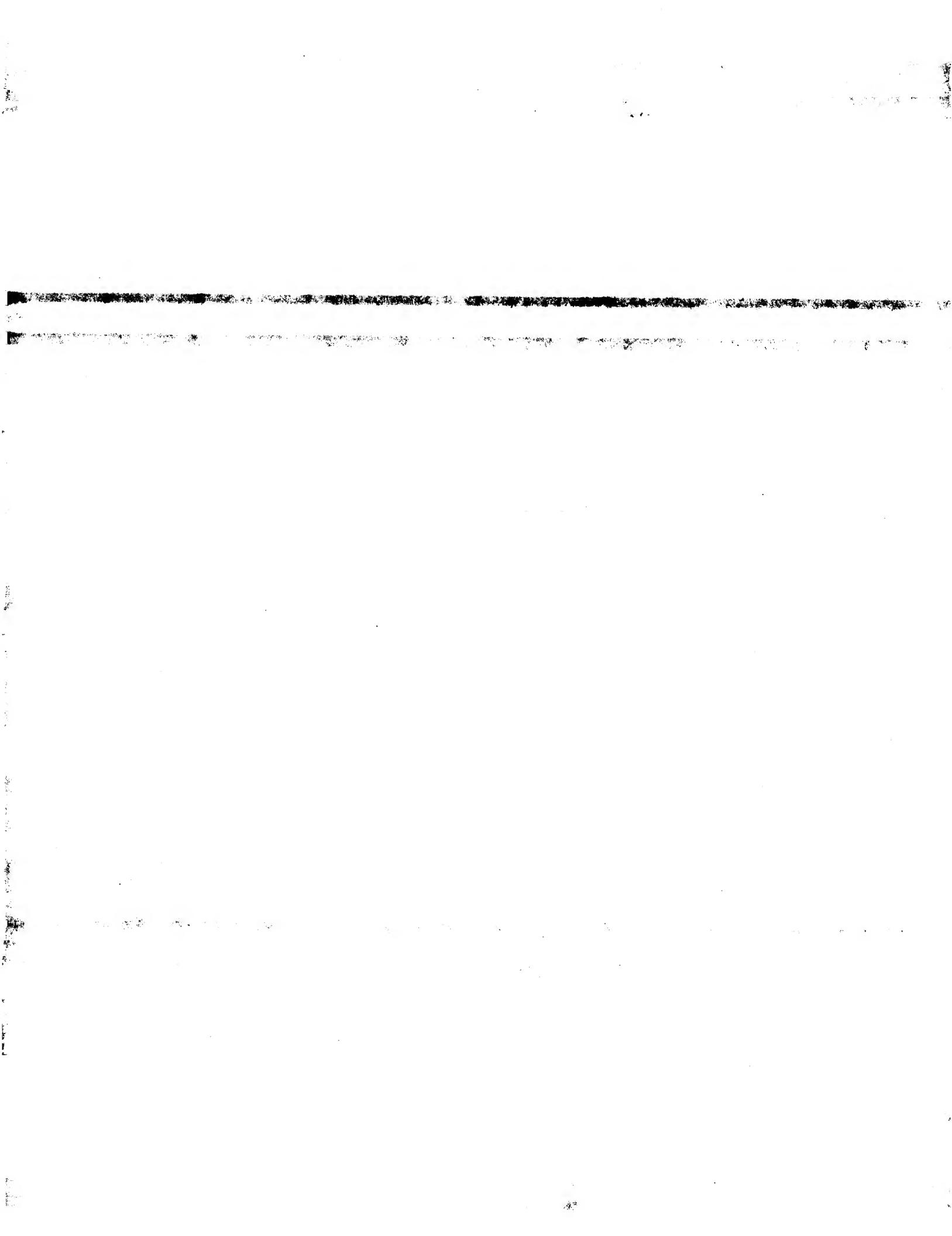
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I HEREBY CERTIFY that annexed hereto is a true copy of
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application:

Application No. S990763

Date of Filing 9 September 1999

Applicant COMTOR LIMITED, an Irish Company of 51/52
Fitzwilliam Square, Dublin 2, Republic of Ireland.

Dated this /51 day of August, 2000.

Marcel Barrett

An officer authorised by the
Controller of Patents, Designs and Trademarks.

REQUEST FOR THE GRANT OF A PATENT

899070

PATENTS ACT, 1992

The Applicant(s) named herein hereby request(s)

the grant of a patent under Part II of the Act

the grant of a short-term patent under Part III of the Act
on the basis of the information furnished hereunder.

1. Applicant(s)

Name COMTOR LIMITED

Address 51/52 Fitzwilliam Square, Dublin 2, Republic of Ireland

Description/Nationality an Irish Company

2. Title of Invention

"A WRAPPING METHOD AND APPARATUS"

3. Declaration of Priority on basis of previously filed
application(s) for same invention (Sections 25 & 26)

Previous filing date Country in or for which filed Filing No.

None

Identification of Inventor(s)

Name(s) of person(s) believed
by Applicant(s) to be the inventor(s)

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The Moorings, Merrion Road, Ballsbridge, Dublin 4,
Ireland

5. Statement of right to be granted a patent (Section 17(2)(b))

Assignment(s) from the Inventor(s) dated 8 September 1999

6. Items accompanying this Request - tick as appropriate

(i) prescribed filing fee (£ 50)

(ii) specification containing a description and claims
 specification containing a description only
 Drawings referred to in description or claims

(iii) An abstract

(iv) Copy of previous application(s) whose priority is claimed

(v) Translation of previous application whose priority is claimed

(vi) Authorisation of Agent (this may be given at 8 below if this Request is signed by the Applicant(s))

7. Divisional Application(s)

The following information is applicable to the present application which is made under Section 24 -

Earlier Application No:
Filing Date:

8. Agent

The following is authorised to act as agent in all proceedings connected with the obtaining of a patent to which this request relates and in relation to any patent granted -

Name Address

TOMKINS & CO. 5, Dartmouth Road,
Dublin 6.

9. Address for Service (if different from that at 8)

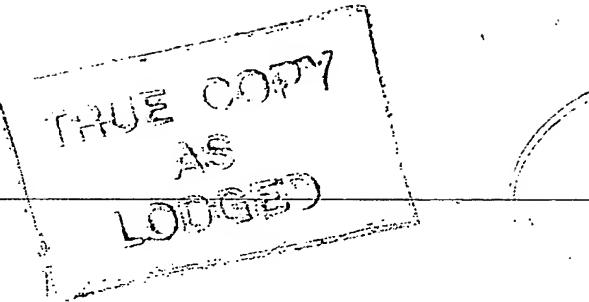
TOMKINS & CO., at their address as recorded for the time being in the Register of Patent Agents.

Signed TOMKINS & CO. Authorised Patent Agents.
Name(s): by:
Capacity (if applicant is a body corporate):

Date 9 September 1999

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A Wrapping Method and Apparatus

20 **Field of the Invention**

The invention relates to a method and apparatus for wrapping loads of goods and materials in a wrapping material including an internal support means to assist in transporting the loads. The invention provides an alternative to a conventional pallet but serves the same purpose of supporting and transporting loads.

25

Background of the Invention

Pallets are commonly used for transporting and storing goods and materials. 30 Pallets typically comprise a portable wooden platform on which the load is carried. The platform usually comprises two parallel planar surfaces spaced apart by transverse wooden battens to form channels intended to receive the forks of a fork-lift truck. Typically the load is built-up on the wooden platform and the whole load may then be heat-shrunk in a suitable plastics wrapping material.

35

5 The use of conventional wooden pallets represents a high element in the cost
of transport and storage, and there is a further significant hidden cost in the logistics of
pallet management. Firstly, there is the production cost of conventional wooden
pallets which each utilise a large number of wooden elements which are joined together
to form the pallet, usually using steel nails. There is a significant cost in the transport
10 of the empty pallets; firstly they have to be shipped to the supplier, who uses the pallets
for the transport of goods to a customer. In many cases, after use they have to be
shipped back to the supplier as a return. It has been found that in the case of hired
pallets, for example, they spend more time being trans-shipped than actually in use.

15 Conventional pallets utilise a lot of storage space at each destination, and in
the event of the pallets being used for perishable goods, they must be stored under
cover. It has been found that in many cases, the cost associated with the use of
conventional pallets represents up to 50% of total packaging costs.

20 The constant shipment of empty pallets results in a high level of pallet
fatigue, resulting in damage to loads, and a high risk of injury to users due to hazardous
pallet loads. The use of steel nails in the manufacture of conventional pallets is also a
problem. There are significant breakages of pallets through handling causing the nails
to protrude from the pallets. These frequently are a cause of motor vehicle tyre
25 punctures and of injury to workers.

WO 99/04613 of the same applicant discloses a wrapping machine for
wrapping materials, in particular compacted bales of material, with a strip of wrapping
material comprising a first wrapping station having wrapping means for applying a strip
30 of wrapping around the bale to partially wrap the bale in wrapping material, a second
wrapping station having wrapping means for applying a strip of wrapping material
around the bale to completely wrap the bale in wrapping material, and transfer means
for transferring the partially wrapped bale from the first wrapping station to the second
wrapping station. This machine is particularly suitable for compacting and wrapping
35 bales of fodder and the like, but also discloses a wrapping machine for wrapping loose

5 material, such as bricks, in a wrapping material. However, it does not disclose means for forming and wrapping a palletized load.

Object of the Invention

10 It is an object of the invention to provide a method which will eliminate the conventional pallet as the main package handling system and the inefficiencies associated with conventional pallets while continuing to provide the conventional pallet's abilities as far as support and ease of transport is concerned. It is also the purpose of the invention to produce a apparatus that will fully automate a process of providing a method of forming palletized loads without the use of conventional pallets.

15

Summary of the Invention

20 In accordance with one aspect the invention provides a method for wrapping loads of goods and materials in a wrapping material, such as a plastics film, which comprises placing at least two battens in a spaced substantially parallel orientation on one surface of the load, partially wrapping the load in a wrapping material by rotating the load relative to dispensing means for the wrapping material, and/or rotating the dispensing means around the load, to envelop the battens in the wrapping material and to hold the battens in place on the surface of the load, the battens being placed apart to support the load and being adapted to receive therebetween the forks of a fork-lift truck for transporting the load.

25

30 In a preferred embodiment the method comprises placing the batten on a top surface of the load, partially wrapping the load at a first wrapping station with a wrapping material including overlapping at least parts of the battens with the wrapping material to hold the battens in position, turning the load through about 90° from the first wrapping station to a second wrapping station, and completing the wrapping of the load at the second wrapping station, including enveloping the battens in the wrapping material. Subsequently, the load is tipped from the second wrapping station onto the side containing the battens, which then act as a pallet to support the load for transport.

35

The invention also includes apparatus for carrying out the method comprising a first wrapping station including a wrapping platform to receive the load to be wrapped, means at the first wrapping station for placing battens on a surface of the load, wrapping material dispensing means at the first wrapping station, means for

10 rotating the platform relative to dispensing means, and/or means for rotating the dispenser relative to the platform, to partially wrap the load, including at least part of the battens, with the wrapping material, means for transferring the load, through about 90° to a second wrapping station, and means at the second wrapping station for completing the wrapping of the load.

Preferably, the wrapping means at the first wrapping station includes means for rotating the load about a vertical axis, and the wrapping means at the second wrapping station includes a belt table for rotating the load about a substantially horizontal axis and film dispensing means for rotation about a substantially vertical axis

20 to apply film to the load as it is rotated about a horizontal axis.

Alternatively, the belt table is additionally rotated about a vertical axis relative to the film dispensing means.

Preferably, the belt table at the second wrapping station is pivotable from a normally horizontal position, through approximately 90°, to a position in which engagement means on the belt table engage with means on the wrapping platform, and the wrapping platform is pivotally mounted, such that when the belt table is returned to its original horizontal position it causes the wrapping platform to swing from a normally horizontal position, through approximately 90°, to deposit the partially wrapped load onto the belt table at the second wrapping station.

The engagement means may include tie-rams.

35 The apparatus may include a tipping device positioned forwardly of the belt table by means of which the load may be tipped from the apparatus. Suitably the belt

5 table is pivotable about a substantially horizontal axis to deposit the wrapped load onto the tipping device.

The invention also relates to a wrapped load including at least two substantially parallel battens located on at least one side surface of the load and held in
10 position by the wrapping material.

The method and apparatus of the invention provides for wrapped loads with an integral pallet thus eliminating many of the inefficiencies and costs associated with the use of conventional pallets. The apparatus of the invention replaces the
15 conventional pallet with two or three battens held in place by the wrapping. The wrapping is applied in two planes substantially at right angles to each other, thus providing a very secure package.

It is estimated that utilising the method and apparatus of the invention there
20 is a saving in the volume of timber of between 300% and 400% compared to the volume of timber needed to manufacture conventional pallets. However, in terms of pallet return transport costs there is an even more dramatic saving. It is estimated that there is a reduction of between 1000 and 1400% in the transportation volumes using the
25 battens of the invention in place of conventional pallets. This makes a very positive contribution in reducing environmental pollution both in terms of vehicle emission and wood/nail waste with the inherent cost savings on pallet storage, transport and management time.

Brief Description of the Drawings

30

Embodiments of the invention are hereinafter described with reference to the accompanying drawings, wherein:

35 Figures 1 to 10 are isometric views of a first embodiment of a machine of the invention, showing the machine at different stage of the wrapping process;

5

Figure 11 is an isometric view of a part of the machine, illustrating means for loading a load onto a first wrapping station;

10 wrapping station;

Figures 13 to 16 are side elevations of details of the first wrapping station of the machine of the invention;

15 Figures 17 to 21 are side elevations of a transfer mechanism of the invention at different stages in its operation;

20 Figures 22 to 24 are isometric views of a second embodiment of the invention;

25 Figures 25 to 34 are respective side elevations and plan views of the machine of Figures 22 to 24, at different stages of the wrapping process;

Figure 35 is an isometric view of a four-way batten for use in the invention;

25 Figure 36 is an isometric view of a two-way batten for use in the invention;

Figures 37 and 38 show the battens of Figures 35 and 36, respectively, in use; and

30 Figure 39 is an isometric view of a further embodiment of two-way batten.

5 Detailed Description

Referring to Figure 1 of the drawings a machine for wrapping and palletizing a load 1 is shown. The load 1 may comprise any goods, materials, cartons, boxes and the like which typically are transported by means of pallets. Suitably, the
10 maximum dimensions of the load 1 are from about 800 - 1600 mm in width and about 2200 mm in height.

The machine shown in Figure 1, looking at it from right to left of the drawing, comprises a delivery conveyor 2, a batten pick and place unit 3, a first
15 wrapping station 4, a transfer means 5, a second wrapping station 6, and unloading means 7.

In uses of the machine, the load 1 to be wrapped and palletized, is placed on the delivery conveyor 2. The delivery conveyor 2 is a fully automated conveyor
20 system utilising chain-driven conveyor rollers or belts. It comprises a first section 10 and a second section 11. The load 1 is first delivered onto the first section 10 and from there is conveyed by the rollers onto the second conveyor section 11. The conveyor 11, the wrapping platform assembly 20, the transfer means 5, and the second wrapping assembly 6 are all mounted in line, on a longitudinal trestle table 13, having legs 14.
25

The load 1 is moved from the second conveyor 11 onto a first wrapping platform 20, which at this stage is co-planar with the conveyor 11. To assist in this movement, a pusher ram 21 is provided (see Figures 3 and 21). The ram 21, which suitably is a hydraulic ram, is normally located beneath the first conveyor section 10,
30 which is caused to tilt upwardly to expose the ram 21, which is mounted on the undercarriage of the conveyor section 10.

At this stage, as shown in Figures 1 and 2, a semi-robotic pick and place unit 3 commences operation. The pick and place unit comprises an upright column 15 on
35 which is mounted a vertically slideable arm 16, which carries a pick and place mechanism 17. The arm 16 is pivotally connected at one end to the column 15 and at

5 its other end to the pick and place mechanism 17. The pick and place mechanism picks up a pair of battens 18 from a stack 19 (see Figure 2) or a dispenser, and places them, in a parallel orientation, transversely of the top surface of the load 1 (see Figure 3). The pick and place mechanism may optionally include vacuum cups or mechanical grabs to pick-up and hold the battens until they are placed on the load.

10

When the load 1 is located on the wrapping platform 20, (as shown in Figures 3 and 11), the first wrapping cycle can begin. During the first wrapping cycle the pick and place mechanism 17 hold the battens in place on the top of the load 1.

15

In this embodiment the wrapping platform 20 is in the form of a rotary turntable, details of which are shown in Figures 12 to 16.

20 It will be noted from Figure 12 that the platform 20 is mounted on a scissors mechanism 22, which is shown in a collapsed position in Figures 12 and 13 such that the platform 20 is aligned with the second conveyor section 11, to receive the load from the conveyor.

25

Details of the wrapping platform 20 and scissors mechanism are shown most clearly in Figures 13 to 16. The turntable and scissors assembly are mounted on wheels 24 which run on rails 25, such that the whole arrangement can move horizontally on the parallel channel rails 25.

30

The scissors mechanism 22 comprises two pairs of crossed arms 26, 27, one pair being disposed to each side of the platform 20. The arms 26, 27 are pivotally connected, by a pivot 28, at their centres. The top ends of the arms 26, 27 support a horizontal frame 29 which carries the wrapping platform 20. The top left side (as shown in Figures 13 to 16) of the arms 26, are connected to fixed pivots 32, whereas the bottom ends of arms 26, 27 are connected to the wheels 24, which are free to slide horizontally in the guide channels 25. The top ends of arms 27 have wheels 30, which run in channels in the frame 29. Thus, by retracting a ram 36, which is connected to the

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5 arms 26, 27, the wheels 24 are brought closer together to cause the scissors mechanism 22 to expand to raise the frame 29 vertically upwards.

The scissors mechanism 22 is shown completely collapsed in Figure 13, with the platform 20 coplanar with the conveyor 11. It is shown partly raised in
10 Figures 14 and 15. In this embodiment the stroke of the ram is about 353 mm which can move the wrapping platform 20 vertically through a height of about 650 mm. Thus, the platform 20 can locate different height loads correctly at the centre of a belt table 50 of the second wrapping means as will be described more fully below.

15 Referring now to Figures 15 and 16, it will be noted that the wrapping platform 20 is mounted for rotation on the frame 29 by means of an externally driven slew ring 34. The slew ring 34 is fixed to the underside of the platform 20, and the slew ring rotates relative to an internal ring 35 fixed to the frame 29. The diameter of the slew ring 34 is typically about 400mm. The slew ring 34 is driven by an electric or
20 hydraulic motor 37, mounted on the frame 29 which engages with teeth on the external periphery of the slew ring. The speed of the motor 37 is ramped up, and ramped down, for safe starting and stopping of the rotation of the wrapping platform 20.

25 The first wrapping of the load 1 is now shown in Figure 4. At this stage the load 1 has been pushed onto the platform 20, which has been raised above the level of the conveyor 11, as described above. The platform 1 is caused to rotate. A film dispenser 40 is mounted on an upright 41, located at the first wrapping station. The film dispenser 41 is of well known constructions and may include a pretensioning unit 42 (see Figure 26) through which plastics wrapping film 43 is fed and stretched. The
30 film dispenser includes a cut and start device for severing the film at the end of wrapping, e.g. of the kind shown in IE S80403.

35 The free end of the film is attached to the load 1, and the platform 20 is caused to rotate by the motor 37. This in turn unwinds the film 43 from the dispenser 40, and causes the film to wrap around the load 1 (see Figure 4).

5

As mentioned above, as the load 1 is rotated by the turntable 20, the arm 16, carrying the battens 18, presses down on the top of the load 1 to hold the battens 18 in position. This is possible because of the pivot between the arm 16 and the pick and place mechanism 17.

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Because the rotary platform 20 is raised above the level of the conveyor section 11, it is possible, during the wrapping process, for the wrapping film to overlap the bottom corners of the load 1. Wrapping continues at this location until all of the exposed side walls of the load 1 are wrapped in the wrapping film 43. The film dispenser 40 is moved vertically upwards along the column 41 to effect a complete wrapping, the individual strands being applied in a spiral configuration, with one strand overlapping the other (see Figure 5). At the top of the load 1, the wrapping material overlaps the top corners and also the ends of the battens 18 to secure the battens in position on top of the load 1. At the bottom of the load the wrapping material overlaps the edge portions of the platform 20. The arm 16 is then raised to release the pick and place mechanism 17. Simultaneously, a new load 1 is advanced towards the pick and place unit 3, as shown in Figure 5.

25

30

At the end of the first wrapping process, the rotary platform 20 orients the load so that it is at the correct orientation for transfer to the second wrapping station. Although not showing in the drawings, the rotary platform 20 may be reduced in size to facilitate its disengagement from the load 1, in particular from overlapping portions of the wrapping material. This may be achieved by having the wrapping platform in two separate parts, which normally are spaced apart a short distance during wrapping, but which are brought together, e.g. by a hydraulic ram to reduce the overall size of the platform.

The transfer means 5 operates to transfer the partly wrapped bale, by turning it through about 90°, from the first wrapping station 4 to the second wrapping station 6.

5 as shown in Figures 6 and 7. The operation of the transfer means 5 is described in more detail below.

As shown in Figures 5, 26 and 27, for example, the second wrapping station 6, comprises a rotary belt table 50, having two space-apart rollers 51, 52 around which 10 an endless conveyor belt 53 travels. The belt table 50 is supported by a frame 54 (see Figure 25), which at its forward end has two depending brackets 55 welded thereto. The brackets 55 are pivotally connected, to respective parallel beams 56, at the rearward ends thereof (see Figures 6 and 25).

15 The forward ends of the beams 56 are pivotally connected to the main fulcrum point 60 of the transfer mechanism (see Figures 5, 6 and 17). Likewise, the first wrapping platform assembly 20, is mounted on a pair of spaced longitudinal beams 62 (see Figure 12), the rearward ends of which are pivotally connected, by brackets 61, to the main common fulcrum 60.

20

In order to transfer the partly wrapped load 1 (Figure 5) from the first wrapping station 4, through 90°, to the second wrapping station 6, the beams 56, carrying the belt table 50, are pivoted upwardly, through about 90°, about the main fulcrum 60, until the beams 56 are substantially vertical (see Figure 6).

25

The partly wrapped load 1 is now moved towards the belt table 50, by moving the whole wrapping platform assembly, on wheels 24, along rails 25. This movement is effected by a ram (Figures 15 and 16) which can move the assembly forwardly and rearwardly. This horizontal movement of the wrapping assembly, 30 together with the vertical movement caused by the scissors mechanism 22, is important to correctly align the load 1 with the transfer means as described below. The first wrapping assembly is shown in its normal working position in Figure 15, and in the forward position, about to engage with the transfer means 5, in Figure 16.

At this point the first wrapping platform assembly 20 is moved vertically 35 and/or horizontally to accurately position the load 1 correctly at the centre of the belt

5 table 50, between the rollers 51. If the load 1 is positioned off-centre on the belt table 50, it can cause the belt 53 to move off the rollers 52, 52 during subsequent operation. The beams 62, carrying the wrapping platform assembly 20 are then caused to pivot upwardly, also about the main fulcrum 60 so as to pivot the platform 20, and the load 1, through about 90° , while simultaneously the belt table 50 is pivoted backwards, 10 through about 90° , to its original horizontal position (see Figure 7). The load 1, which has been turned through 90° , now rests on the belt table 50. The wrapping platform assembly 20, is now returned also to the horizontal position.

15 The mechanism for achieving this transfer is illustrated, to an enlarged scale, in Figures 17 to 21.

Figure 17 shows the arrangement when both the wrapping platform 20 and the belt table 50 are horizontal.

20 The cylinder of a tie ram 70 is pivotally connected to a bracket 72 fixed to the beams 56 carrying the belt table 50. The rod 71 of the tie ram 70 is pivotally connected to a triangular-shaped bracket 73 fixed to the beams 62 which carry the first wrapping platform 20. A lower ram has a cylinder 63 pivotally connected to a bracket 65, attached to the fulcrum 60, and a rod pivotally connected to the bracket 73.

25 Figure 18 shows the tie ram 70 having been retracted to pull the beams 56, and belt table 50, upwardly through 90° . This is achieved by locking the lower ram 63 so that it acts as an anchor for the tie ram 70 to work against.

30 In Figure 19, the tie ram 70 is shown locked, and the lower ram 63 pushes to rotate the beams 62, carrying the wrapping platform 20, about the common fulcrum point 60. This figure shows the rotation in mid-cycle, with the beams 56 rotating back towards the horizontal.

35 Figure 20 shows the completion of the rotation of the beams 62 from the horizontal to the vertical position, while beams 56 have returned to the horizontal.

5

Figure 21 shows the tie ram 70 beginning to push the beams 62 back towards the horizontal, and to disengage the wrapping platform from the bottom surface of the load 1, where the plastics wrapping has overlapped the edge of the wrapping platform 20. The lower ram 63 acts as a damper and eases the travel of the wrapping
10 platform 20 as it returns to its original position.

After transfer of the load 1 onto the belt table 50, at the second wrapping station, as shown in Figures 7, 29 and 30, the first wrapping platform 2 returns to the horizontal position as described above, ready to receive the next load 1.

15

As shown in Figure 8, a film dispenser 80 is located on an upright column 81 at the second wrapping station 6. The film dispenser is similar to the film dispenser 40 described above, and is also fitted with a pretensioning unit. However, in this case the film dispenser is fixed in position as it does not need to move vertically.

20

The free end of the film 83 is attached to the partly wrapped load 1, and the belt table is rotated, in well known manner, to rotate the load 1 about a vertical axis. Simultaneously, the rollers 51, 52 are driven to cause the belt 53 to travel about the rollers. This rotates the load 1 about a horizontal axis, for example as described in EP 539549.

25

30

The rotation of the load 1 about two axes ensures a complete wrapping of the bale in plastics film, including a complete covering of the battens 18. In this second wrapping operation, the webs of plastics film are applied to the surface of the load 1 in a direction which is substantially perpendicular to the direction of the webs applied in the first wrapping operation. This ensures a very effective and tight wrapping of the load 1, and renders the load 1 weatherproof and waterproof.

35

After the second wrapping cycle, the completely wrapped load 1, is tipped from the belt table 50, as shown in Figures 9, 33 and 34 onto a tipping platform 88.

5

As the load 1 is tipped rearwardly it comes in contact with a transverse pivot platform 88. This is supported and held in place by two arms 87 which are pivoted to the trestle 13. The downward movement of the arms 87 is restricted by two hydraulic accumulator rams 89. As the weight of the load 1 comes onto the pivot platform 88 it
10 causes the arms 87 to swing down onto the ground, as shown in Figure 8, against the bias of the rams. The load 1 on the platform 88 is thus lowered gently onto the ground. The pivot platform 88 has a plurality of rollers 90 to facilitate the moving of the load 1 onto a conveyor 91 (see Figure 10). The pivot platform 88 has limited rotational movement about its mounting point on the arms 87. As the load reaches the horizontal
15 the pivot platform 88 strikes a suitably positioned stop, which causes the platform 88 and the load 1 to tilt slightly forward to cause the load 1 to slide off the platform 88 onto the off-loading conveyor 91. The arms 87 are then raised by the rams 89 to their upper position. The inner ends of the arms 87 are pivotally connected to brackets, one on each side of the machine.

20

It will be appreciated that the wrapped load 1 has been lowered onto the tipping platform 88 with the battens 18 on the underside of the load 1 to facilitate subsequent handling of the load 1 by a fork lift truck or the like as described below.

25

Details of the battens 18 which may be used in the invention are now described with reference to Figures 35 to 39.

30

Figure 35 shows a four-way batten 18. The batten is preferably made of wood and has an elongate shape. The top surface of the batten, which abuts the underside surface of the load 1, is planar. The bottom surface of the batten, which is intended, in use, to rest on the ground is provided with two side fork-entry openings 19. Thus, when two battens are arranged in parallel spaced-apart relationship on the underside of the load 1, as shown for example in Figure 10, a fork lift truck operator has the option of inserting the forks from the front or rear, or between the battens from either side, that is parallel to the battens, or alternatively to insert the forks from the side through the openings 19, that is in a direction substantially perpendicular to the battens

35

5 18. Suitably, the dimensions of the four-way batten are about 120 mm in width, 100 mm in depth, and 1100 mm in length.

10 Figure 36 shows a simple two-way batten 18, that is a batten suitable for fork entry from the front or rear of the load 1 only, but not from the side. This batten may be smaller in size than the four-way batten, typically having dimensions of about 100 mm x 80 mm x 1100 mm. A similar two-way batten is shown in Figure 39, but formed with a cut-away portion in the lower side thereof.

15 Figures 37 and 38 show the battens 18 in use on the underside of the load 1. In the case of the four-way batten shown in Figure 34, it will be noted that the several layers of plastics film 43 holds the battens 18 firmly in place. The plastics film 43 shrinks itself into the openings 19 such that in use the forks of a fork lift truck may enter the openings 19 without tearing the film 43. However, because of the multi-layers of film 43 used in the wrapping process the battens 18 will still be held firmly 20 even if some of the film 43 is torn by the forks. It will be noted that the bottom profile of the batten 18 is such as to provide ridges 49. The purpose of these ridges is to reduce the contact area of the batten with the ground, so as to reduce abrasion of the film 43.

25 As shown in Figures 37, 38 and 39 the ends of the battens have inclines 48, that is the end walls may be inclined at about 70° to the horizontal. Again, this assists in reducing abrasion or tearing of the film 43 in the corner regions of the load 1.

30 A second embodiment of the invention is illustrated in Figures 22 to 34. This embodiment is essentially similar to that described above and like reference numerals denote like parts. The differences between this embodiment and the previous one is that in the second wrapping station 6, the fixed film dispenser 40 is replaced by a rotary film dispenser 44.

5 A vertical support column 41 is positioned to one side of the wrapping machine. A swinging arm 45 is pivotally mounted on, and extends horizontally from, the support member 41 near the top thereof. The arm 45 is swingable, through approximately 90°, by hydraulically operable means.

10 A rotatable hydraulic drive member 47 is mounted on the end of the swingable arm 45. This carries a rotary support arm 46 which is rotatable about a vertical axis defined by the drive member 47. A vertically disposed wrapping arm 59 depends downwardly from the end of the rotary support arm 46. The wrapping arm 59 has the dispenser 44 of plastics film rotatably mounted on the lower end thereof. The 15 hydraulic drive member 47 can thus cause the film dispenser 44 to rotate around the load 1 along the circular path indicated by the line in Figure 24.

20 The film dispenser 44 is of well known construction and may include a pretensioning unit through which the plastics film is fed and stretched. The film dispenser may include a cut and start device for severing the film at the end of wrapping.

25 To commence wrapping a free end of the plastics film 43 is attached to the load 1. The film dispenser is then caused to rotate around the load 1 to wrap the remainder of the load 1 in plastics film. Simultaneously the belt 53 is driven by the rollers 51, 52 to turn the load 1 about a horizontal axis, as shown by broken line in Figure 24. However, in this embodiment the belt table 50 is not rotated about a vertical axis.

30 The words "comprises/comprising" and the words "having/including" when used herein with reference to the present invention are used to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof.

5 Claims

1. A method for wrapping loads of goods and materials in a wrapping material, such as a plastics film, which comprises placing at least two battens in a spaced substantially parallel orientation on one surface of the load, partially wrapping the load in a wrapping material by rotating the load relative to dispensing means for the wrapping material, and/or rotating the dispensing means around the load, to envelop the battens in the wrapping material and to hold the battens in place on the surface of the load, the battens being placed apart to support the load and being adapted to receive therebetween the forks of a fork-lift truck for transporting the load.
10
2. A method as claimed in Claim 2 comprising placing the batten on a top surface of the load, partially wrapping the load at a first wrapping station with a wrapping material including overlapping at least parts of the battens with the wrapping material to hold the battens in position, turning the load through about 90° from the first wrapping station to a second wrapping station, and completing the wrapping of the load at the second wrapping station, including enveloping the battens in the wrapping material.
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3. Apparatus for wrapping a load comprising a first wrapping station including a wrapping platform to receive the load to be wrapped, means at the first wrapping station for placing battens on a surface of the load, wrapping material dispensing means at the first wrapping station, means for rotating the platform relative to dispensing means, and/or means for rotating the dispenser relative to the platform, to partially wrap the load, including at least part of the battens, with the wrapping material, means for transferring the load, through about 90° to a second wrapping station, and means at the second wrapping station for completing the wrapping of the load.
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4. Apparatus as claimed in Claim 3, wherein the wrapping means at the first wrapping station includes means for rotating the load about a vertical axis, and the wrapping means at the second wrapping station includes a belt table for rotating the load about a substantially horizontal axis and film dispensing means for rotation about a
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5 substantially vertical axis to apply film to the load as it is rotated about a horizontal axis.

5. Apparatus as claimed in Claim 3 or Claim 4, wherein the belt table at the second wrapping station is pivotable from a normally horizontal position, through
10 approximately 90°, to a position in which engagement means on the belt table engage with means on the wrapping platform, and the wrapping platform is pivotally mounted, such that when the belt table is returned to its original horizontal position it causes the wrapping platform to swing from a normally horizontal position, through approximately 90°, to deposit the partially wrapped load onto the belt table at the
15 second wrapping station.

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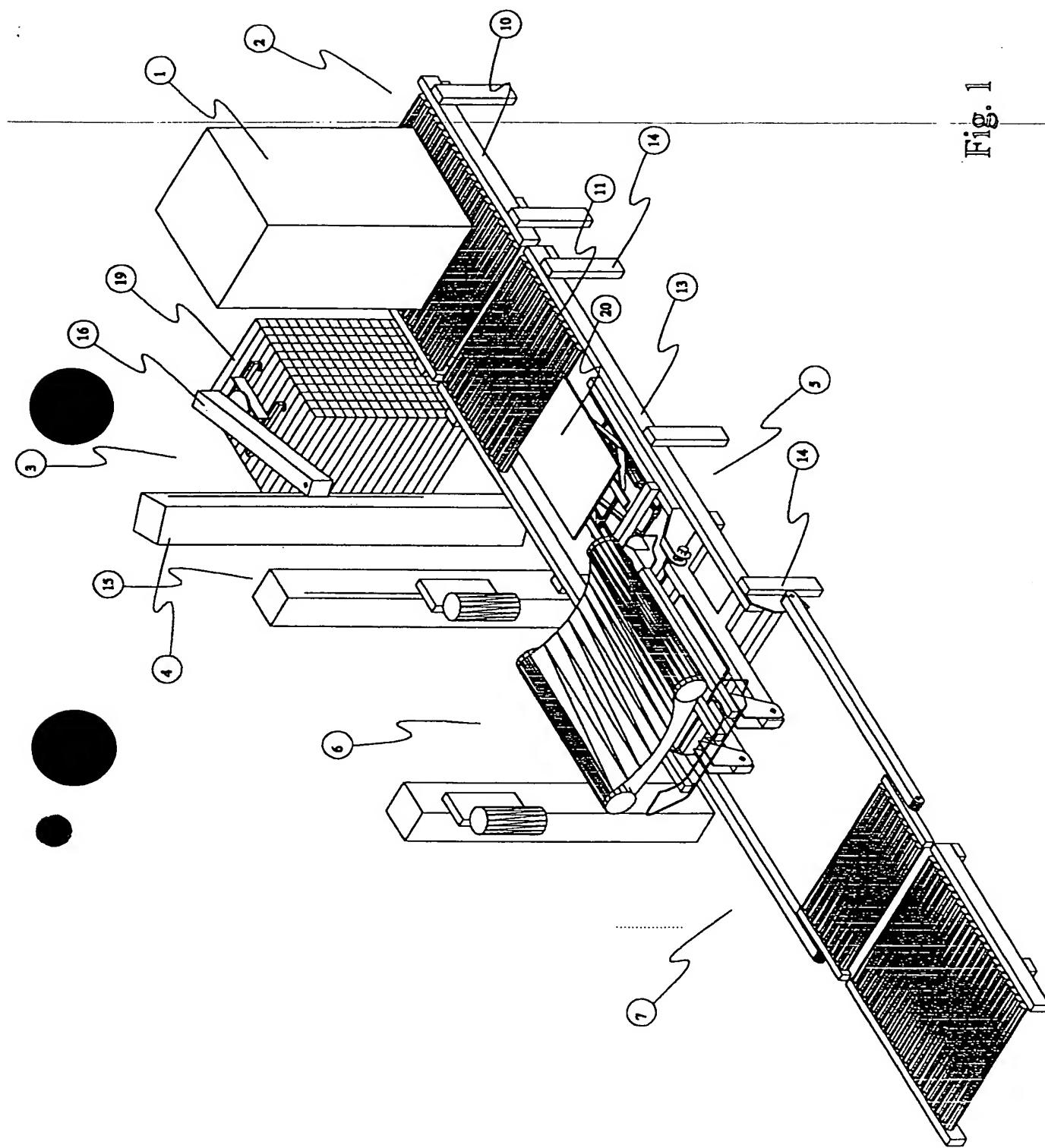
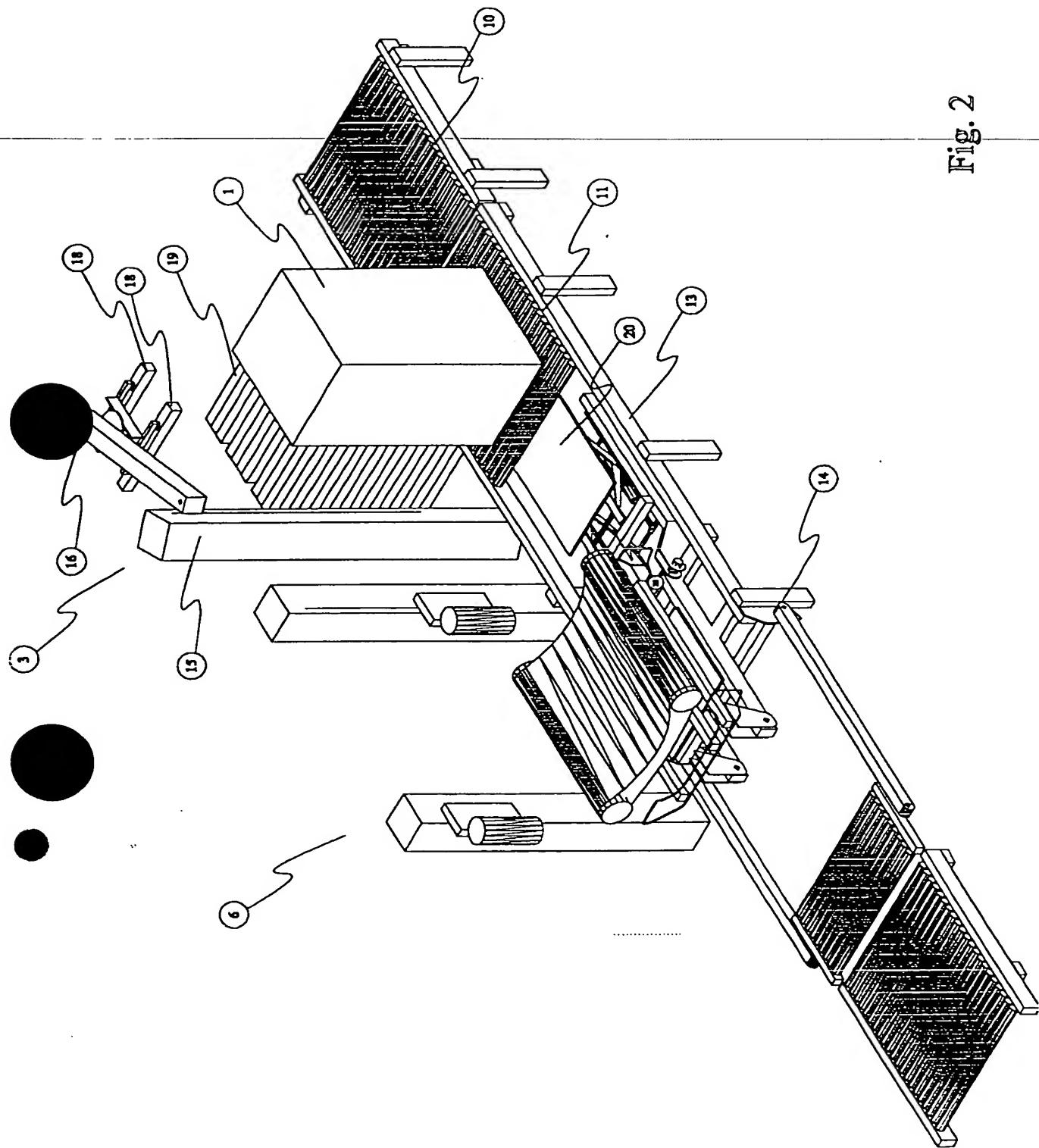
Fig. 1
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Fig. 2



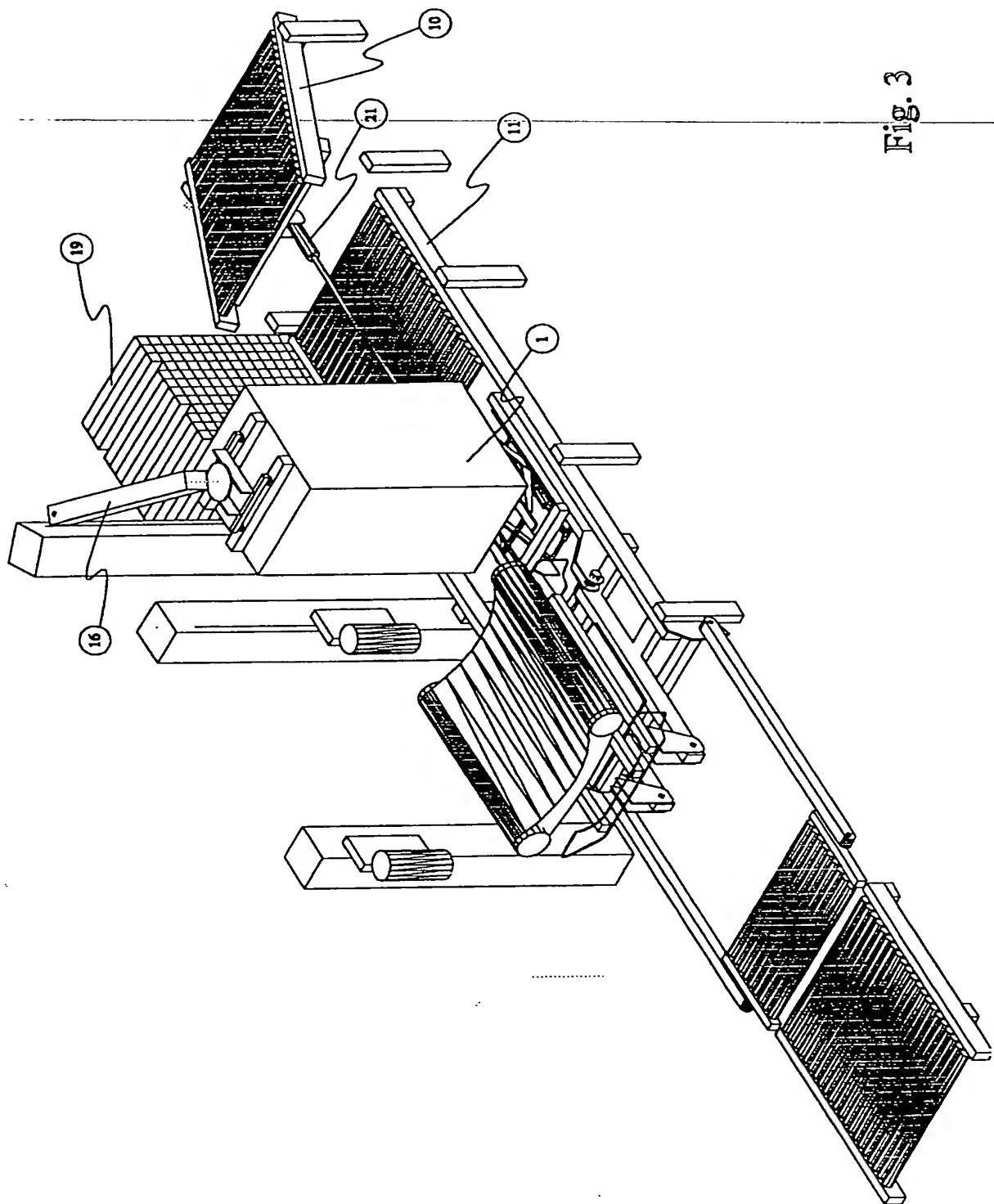
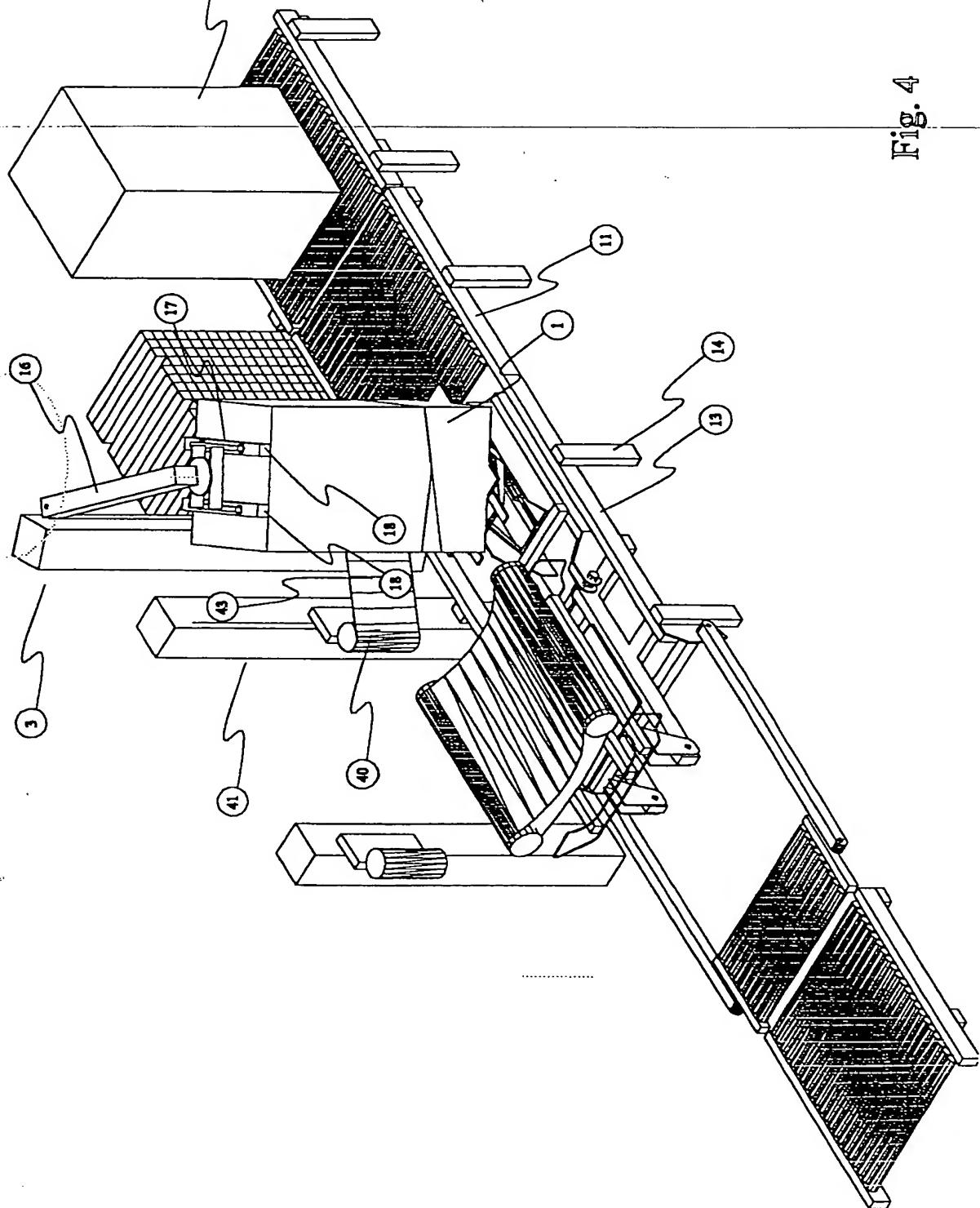


Fig. 3

Fig. 4



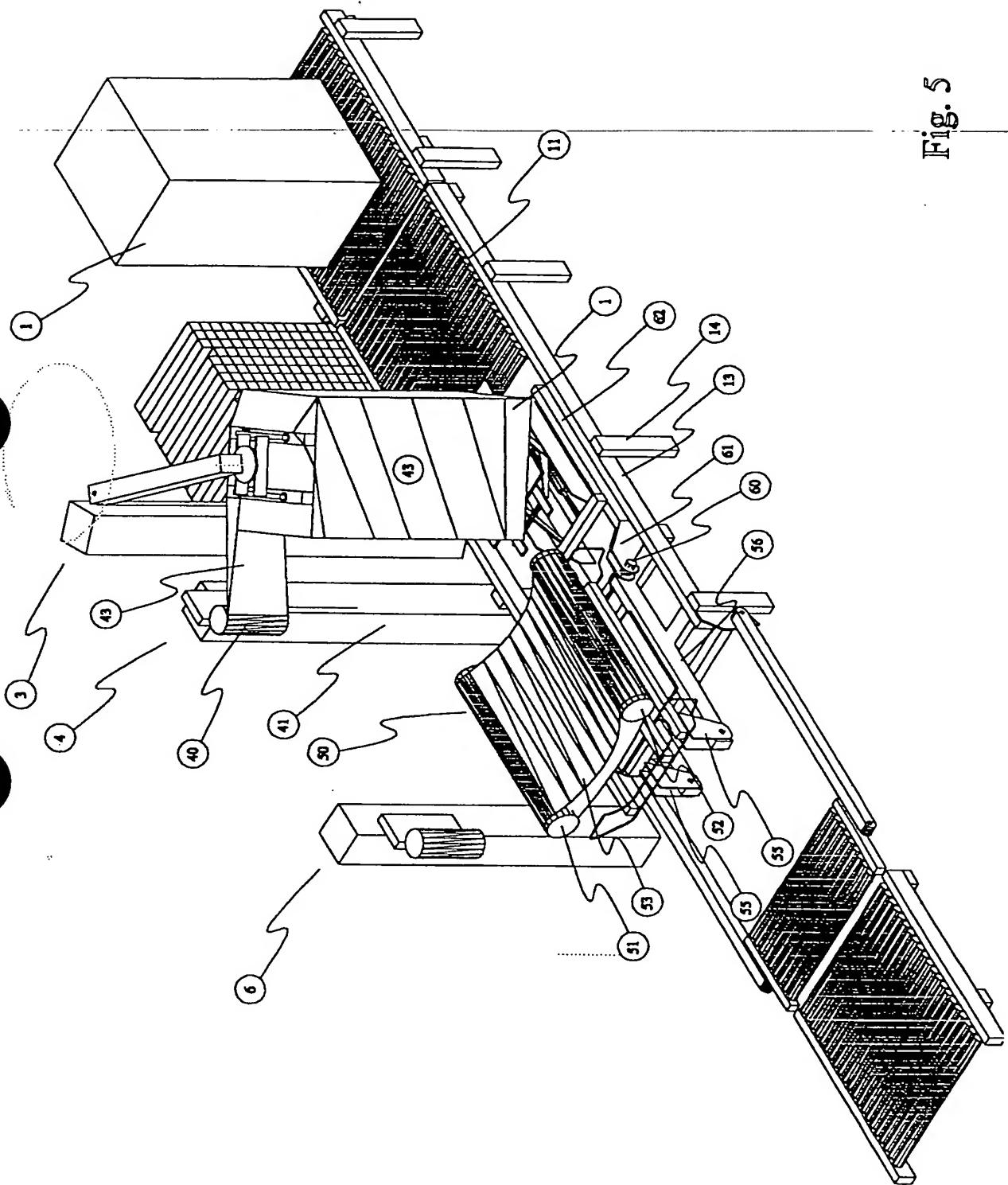


Fig. 5

Fig. 6

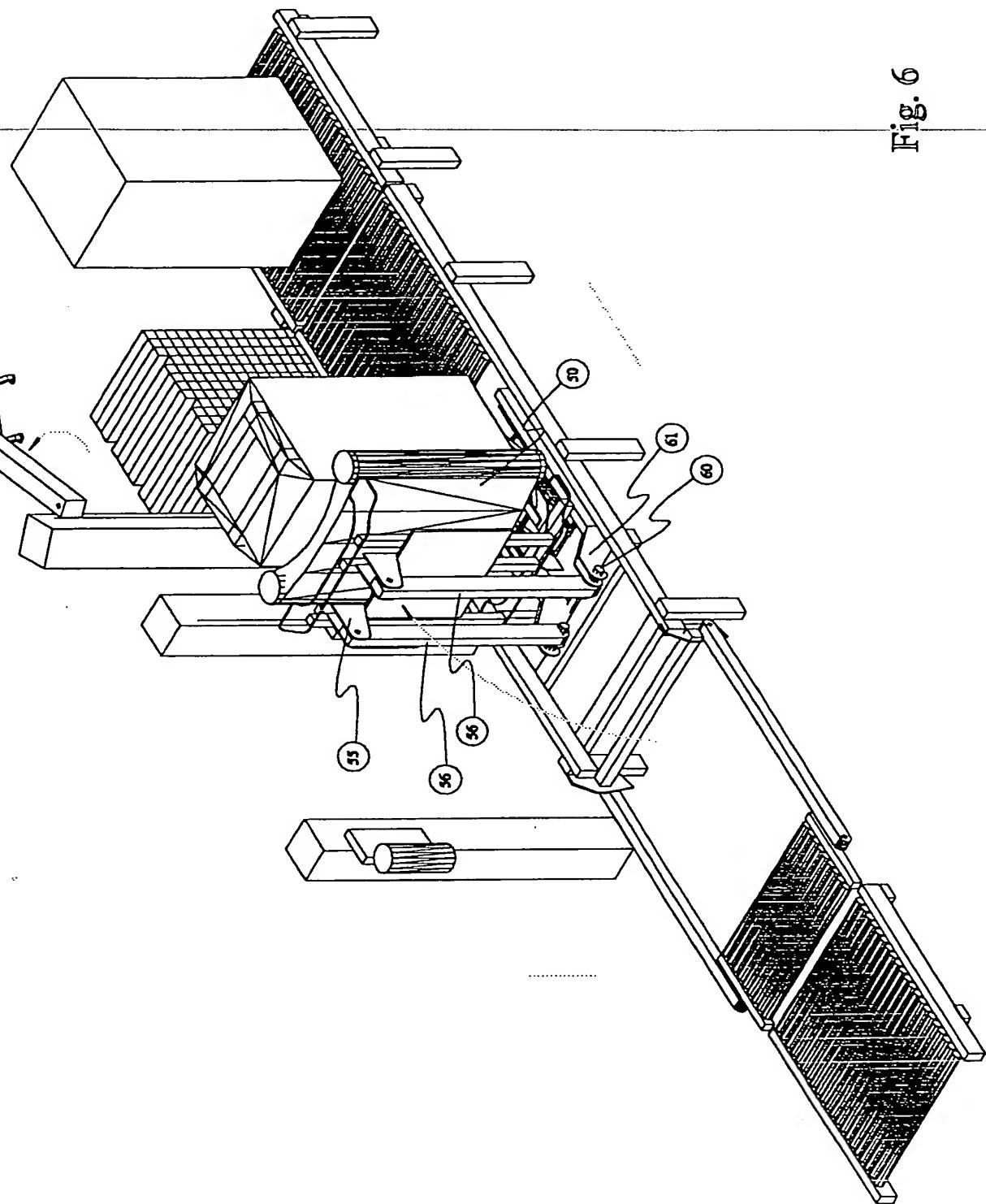
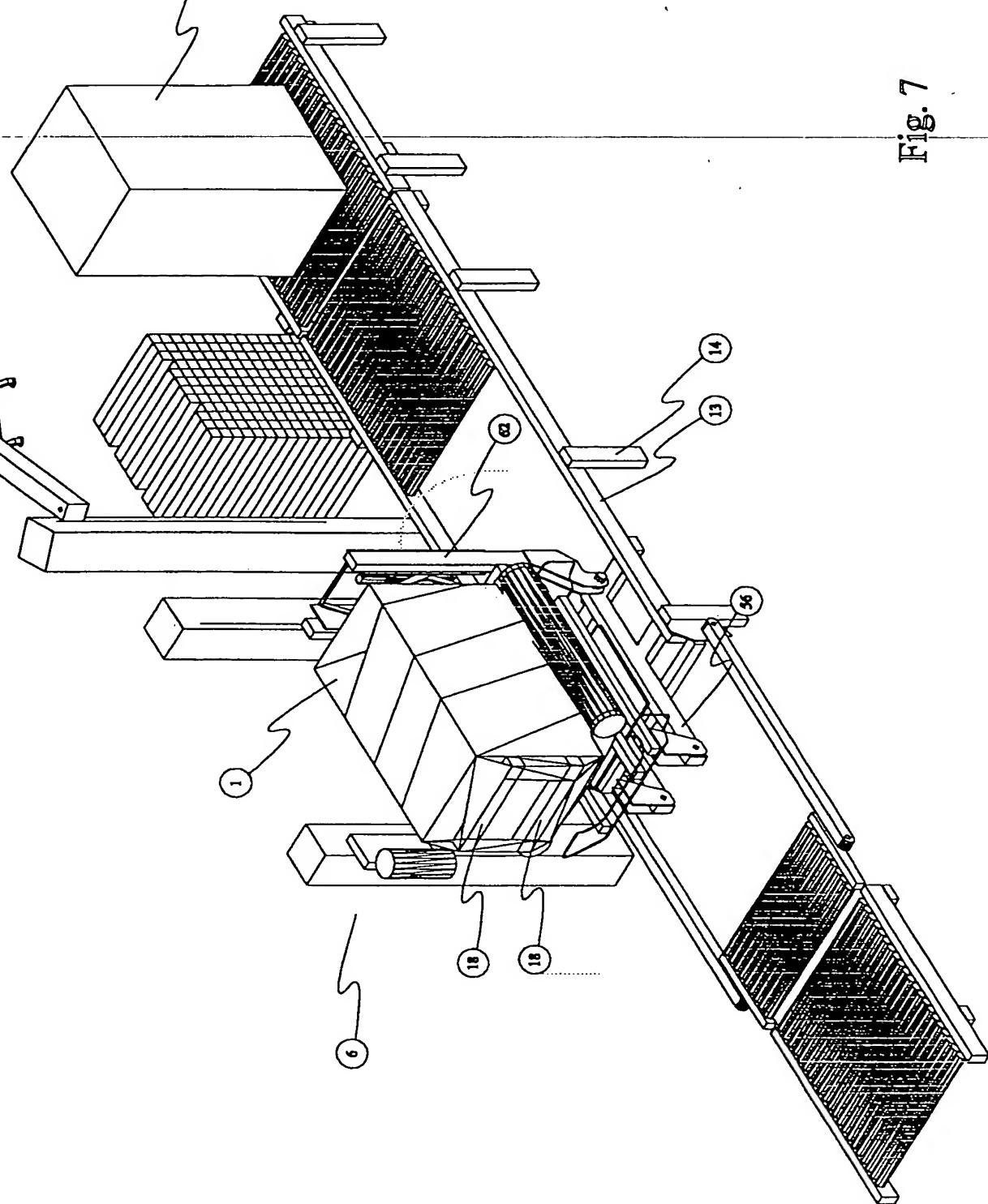
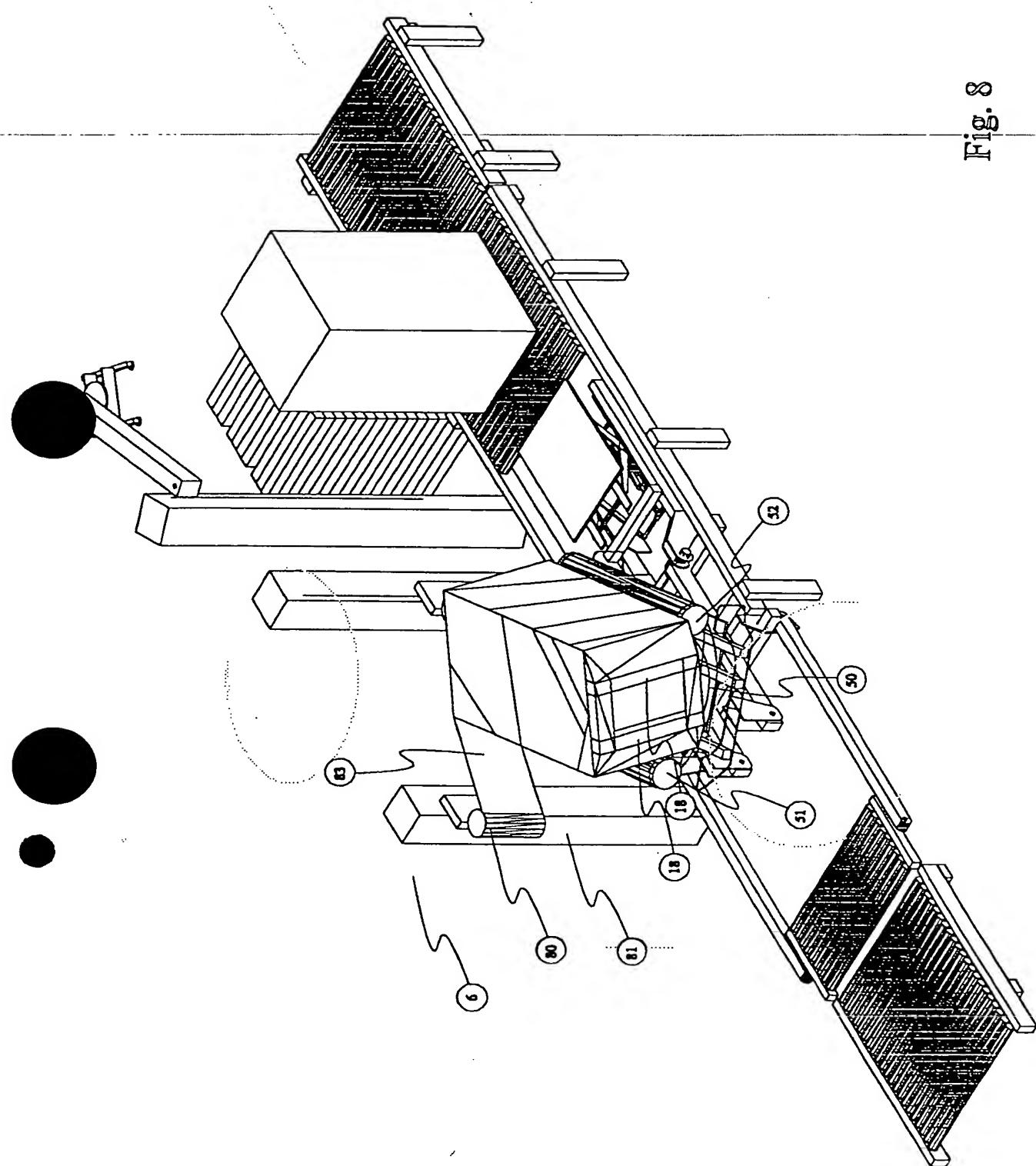
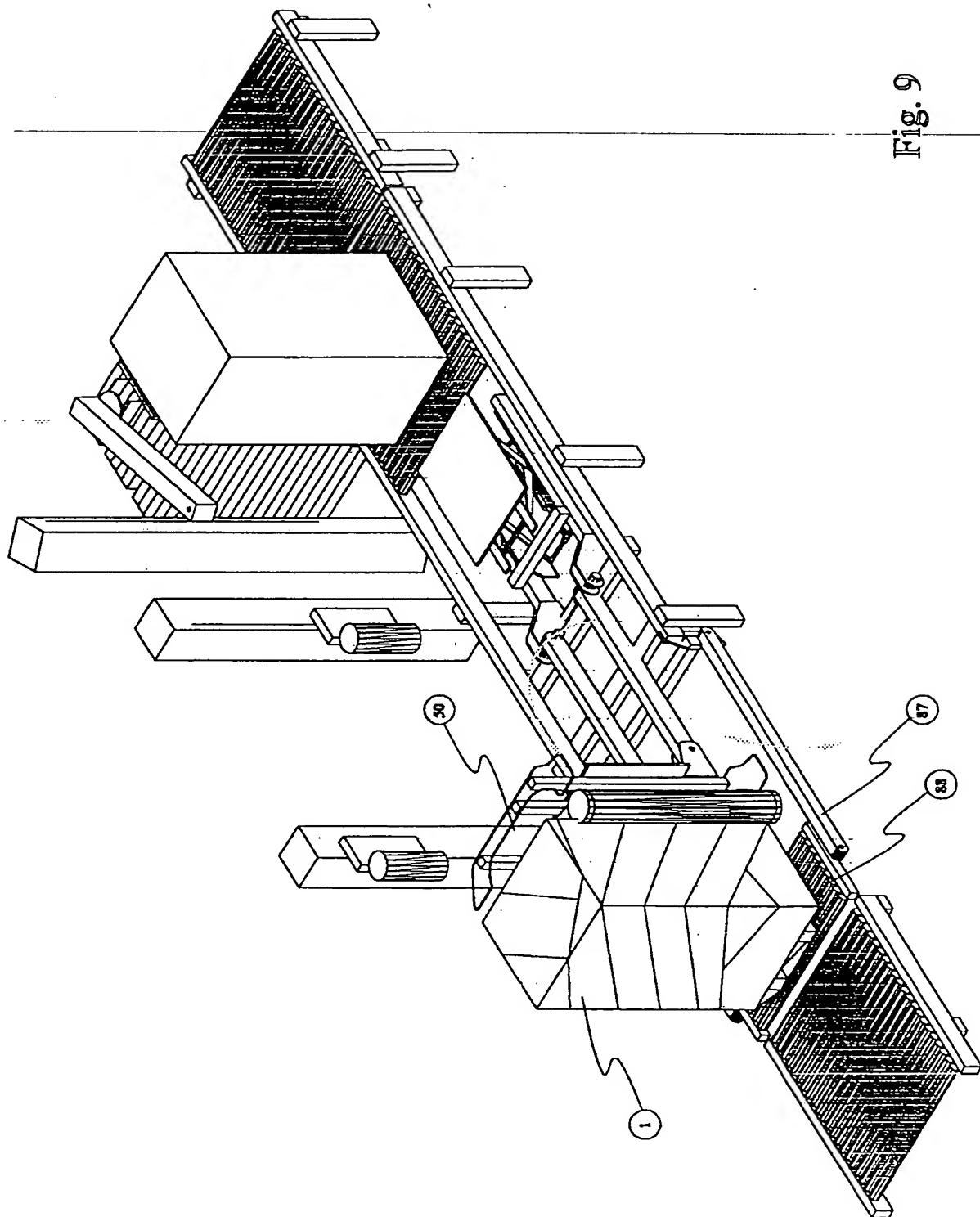


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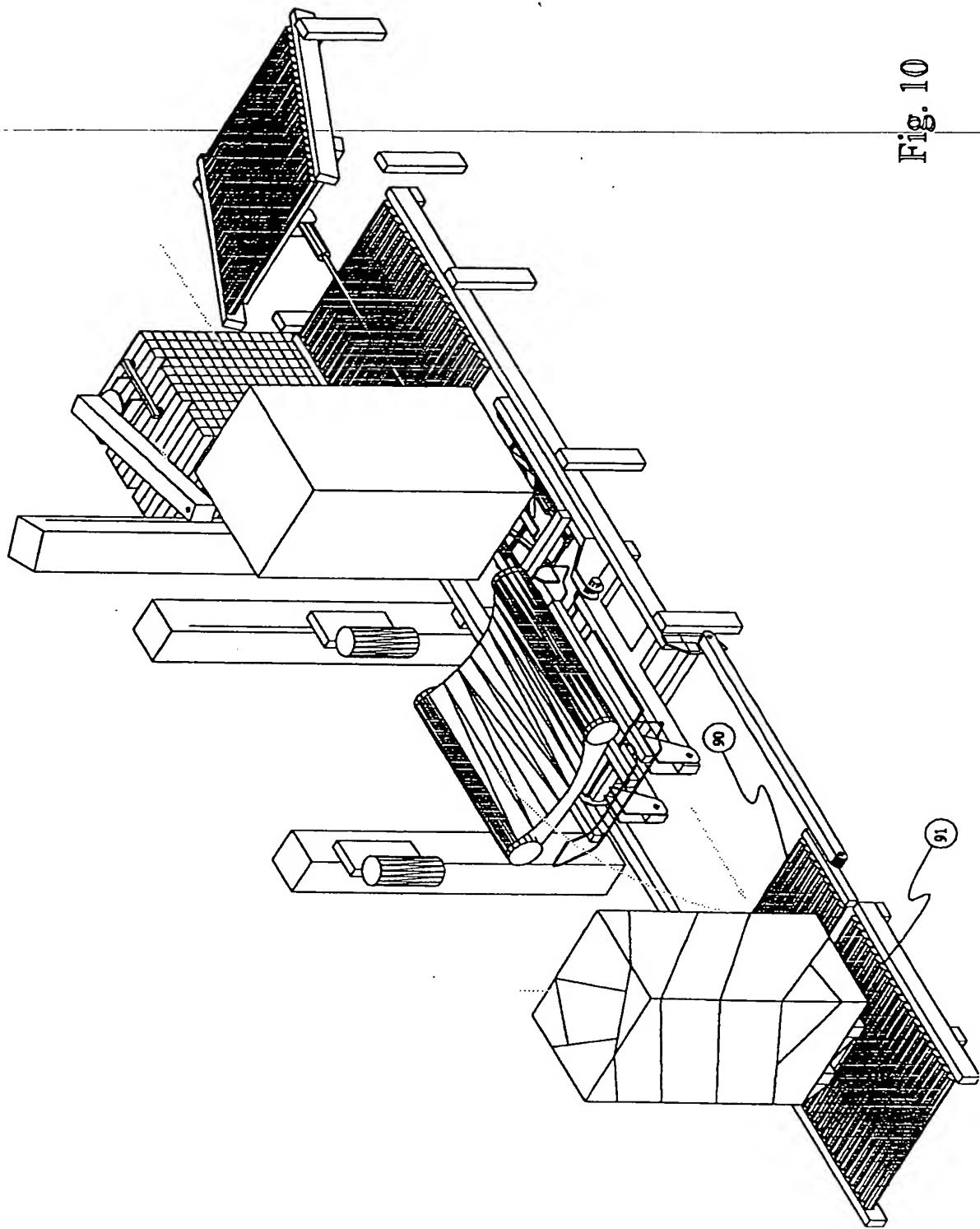






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Fig. 10



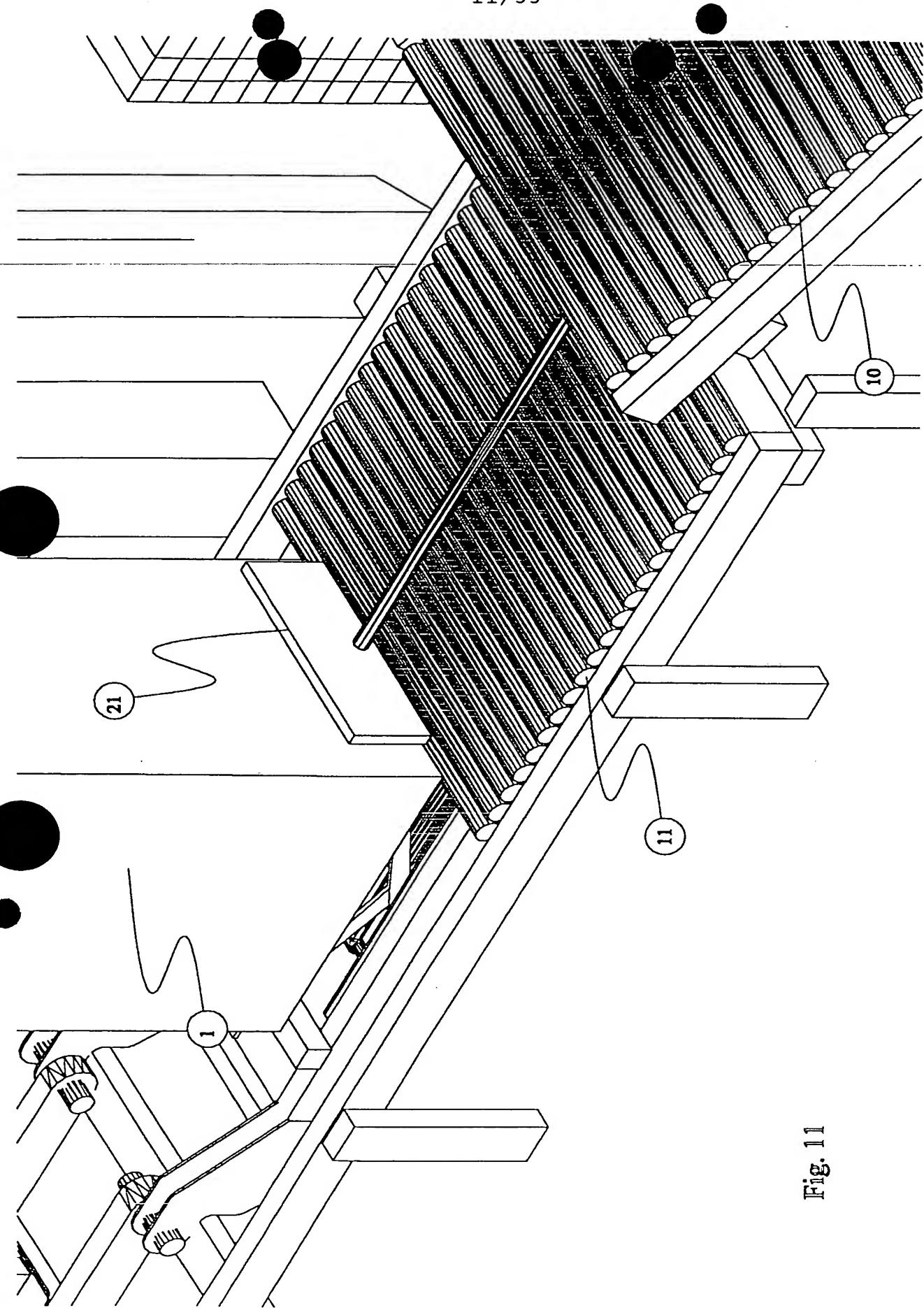


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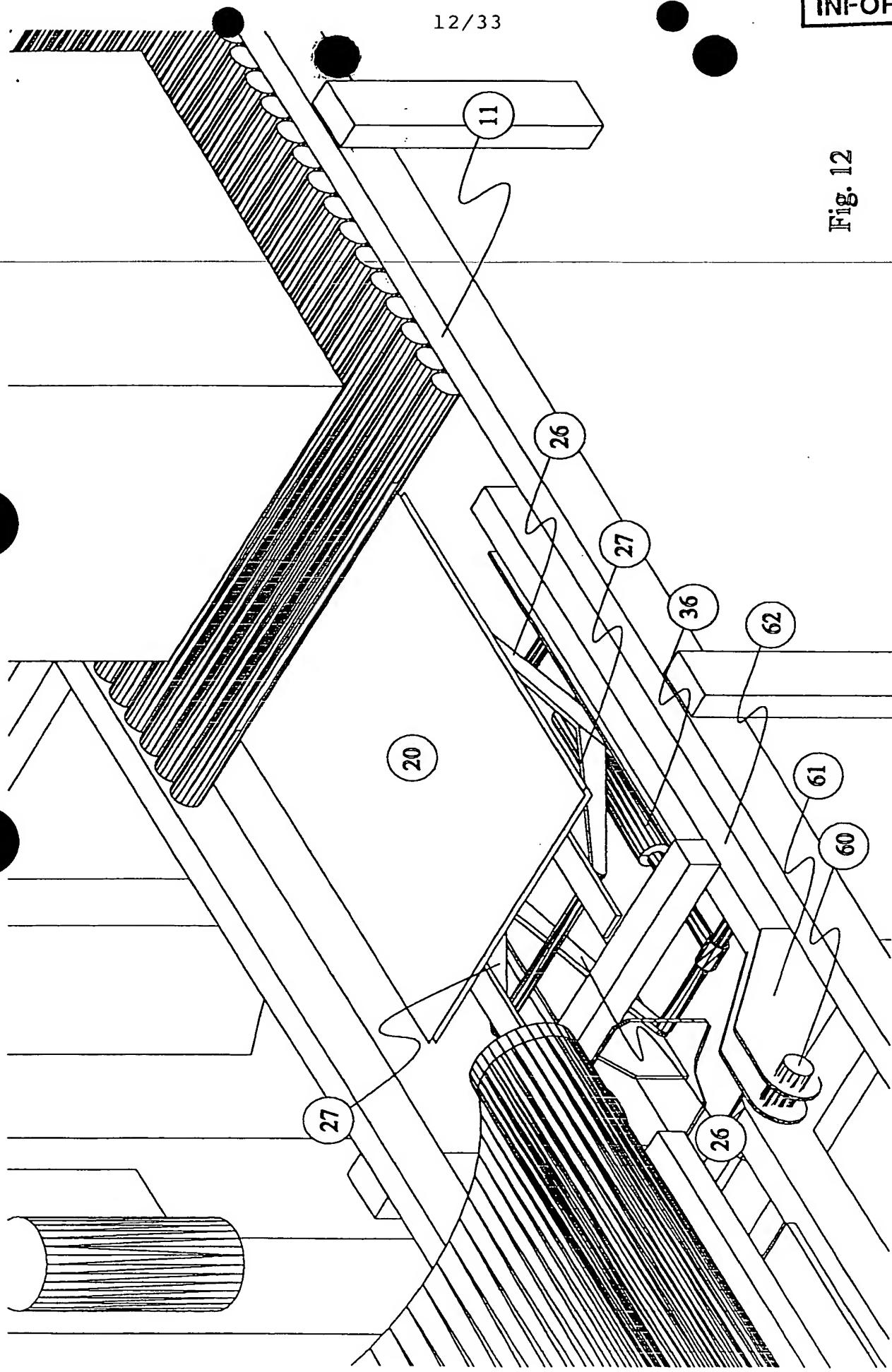


Fig. 12

Fig. 13

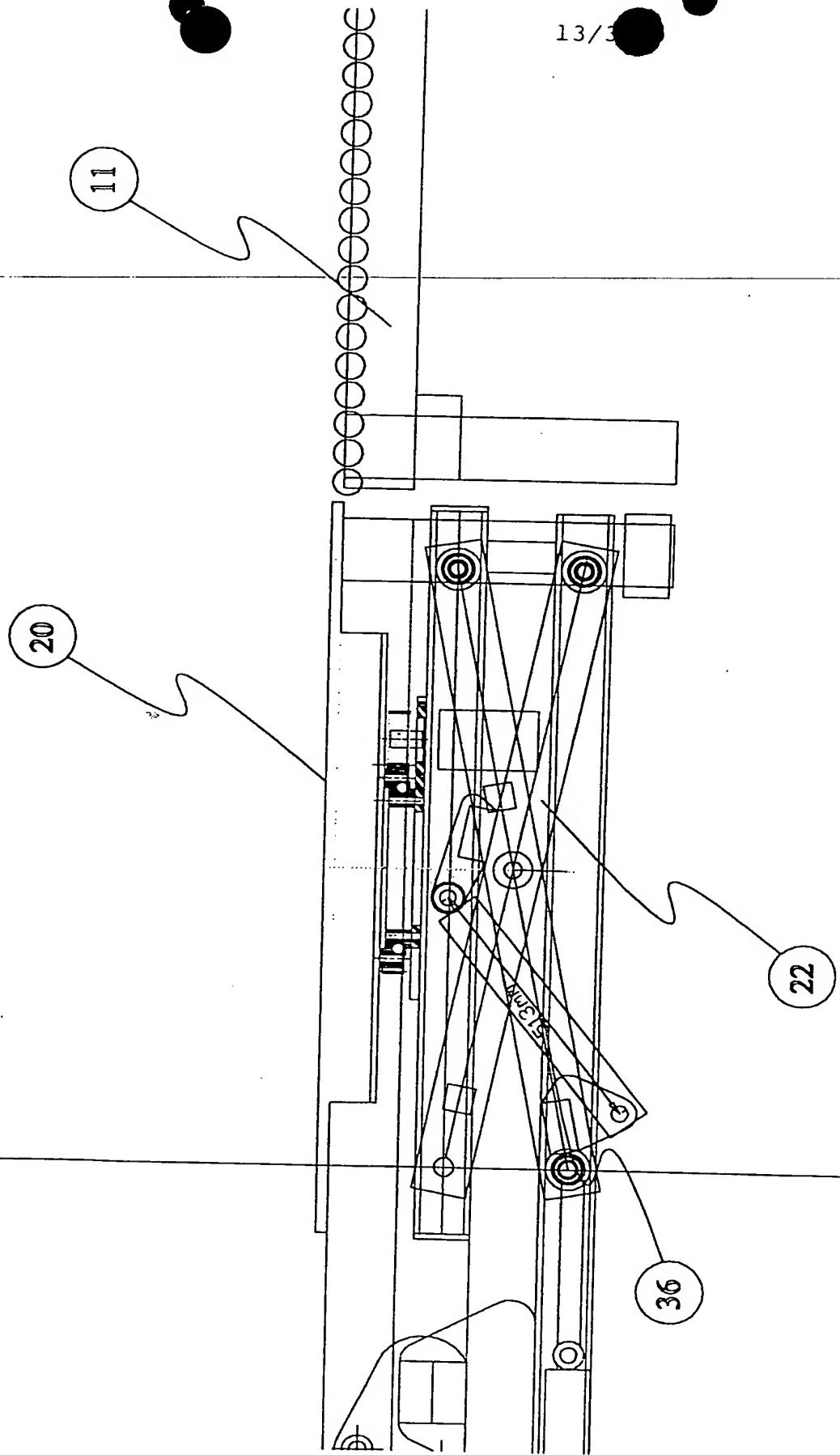


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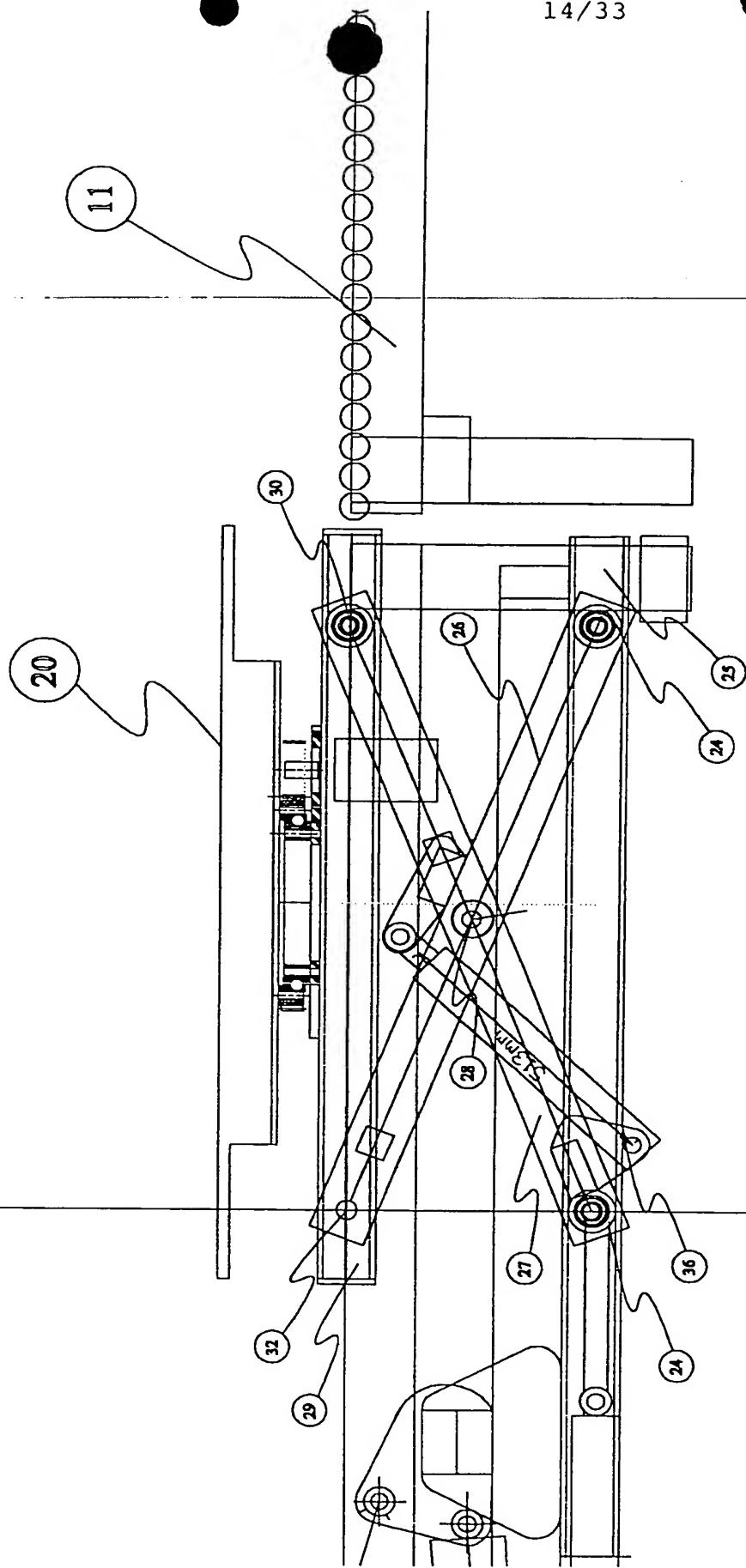
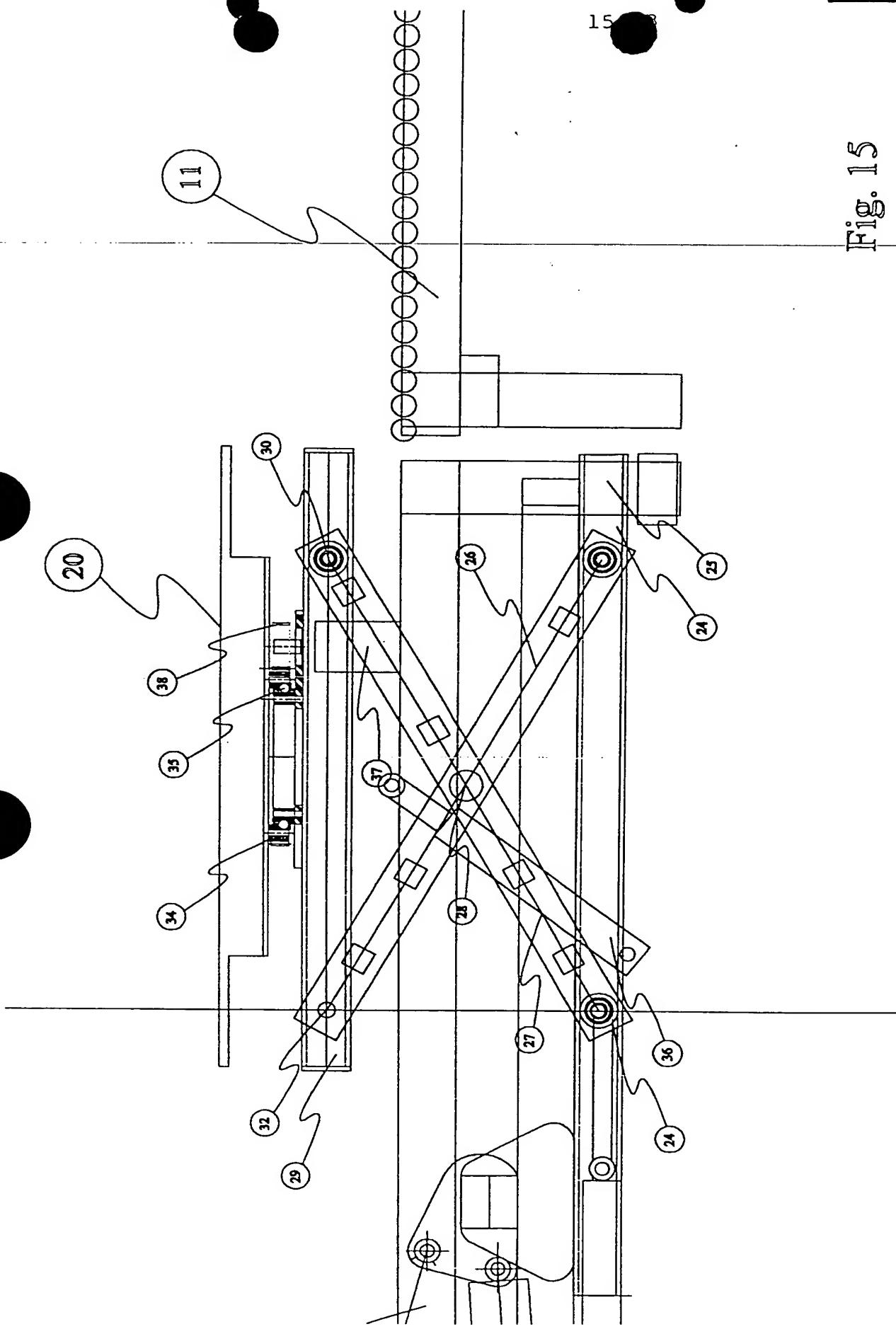
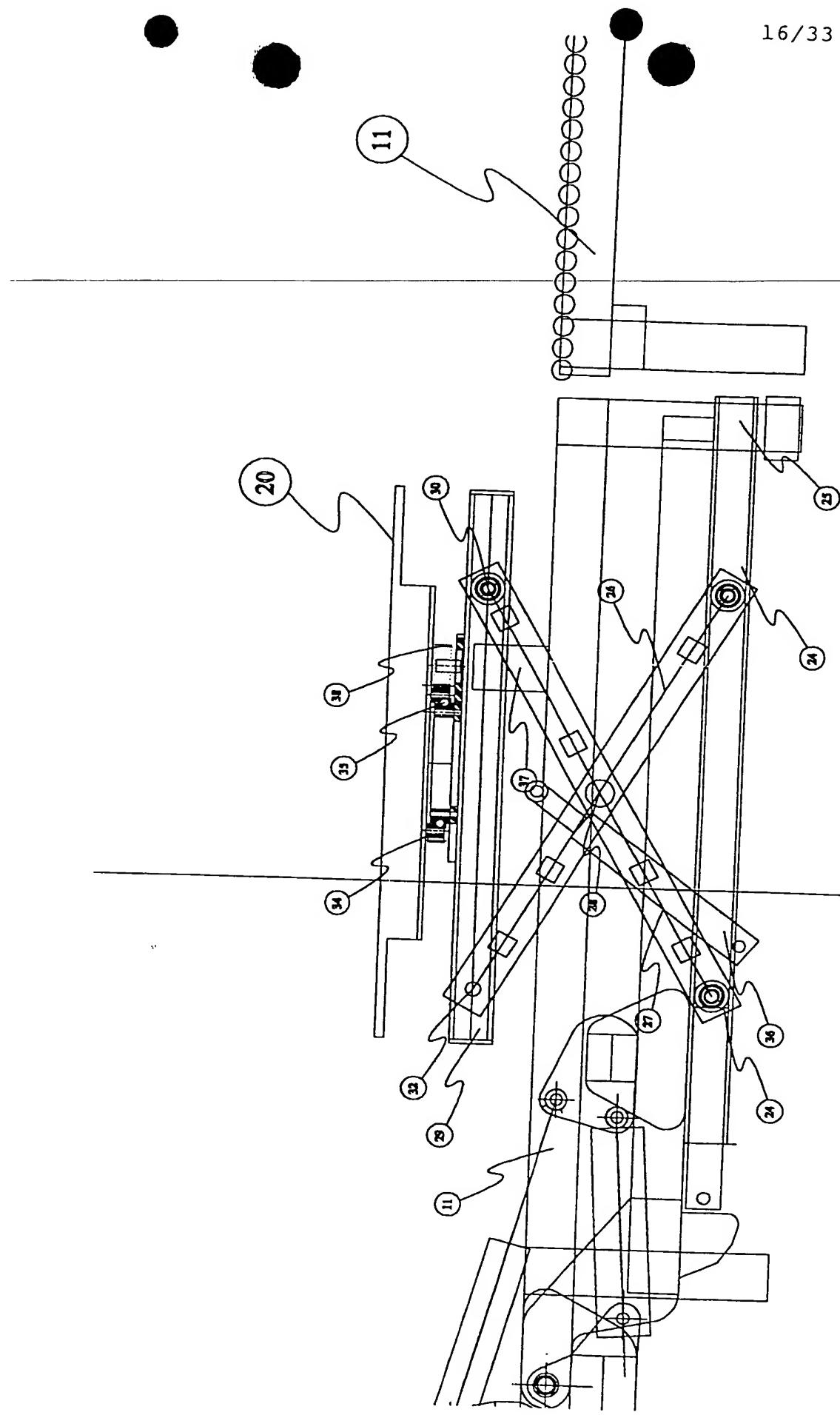


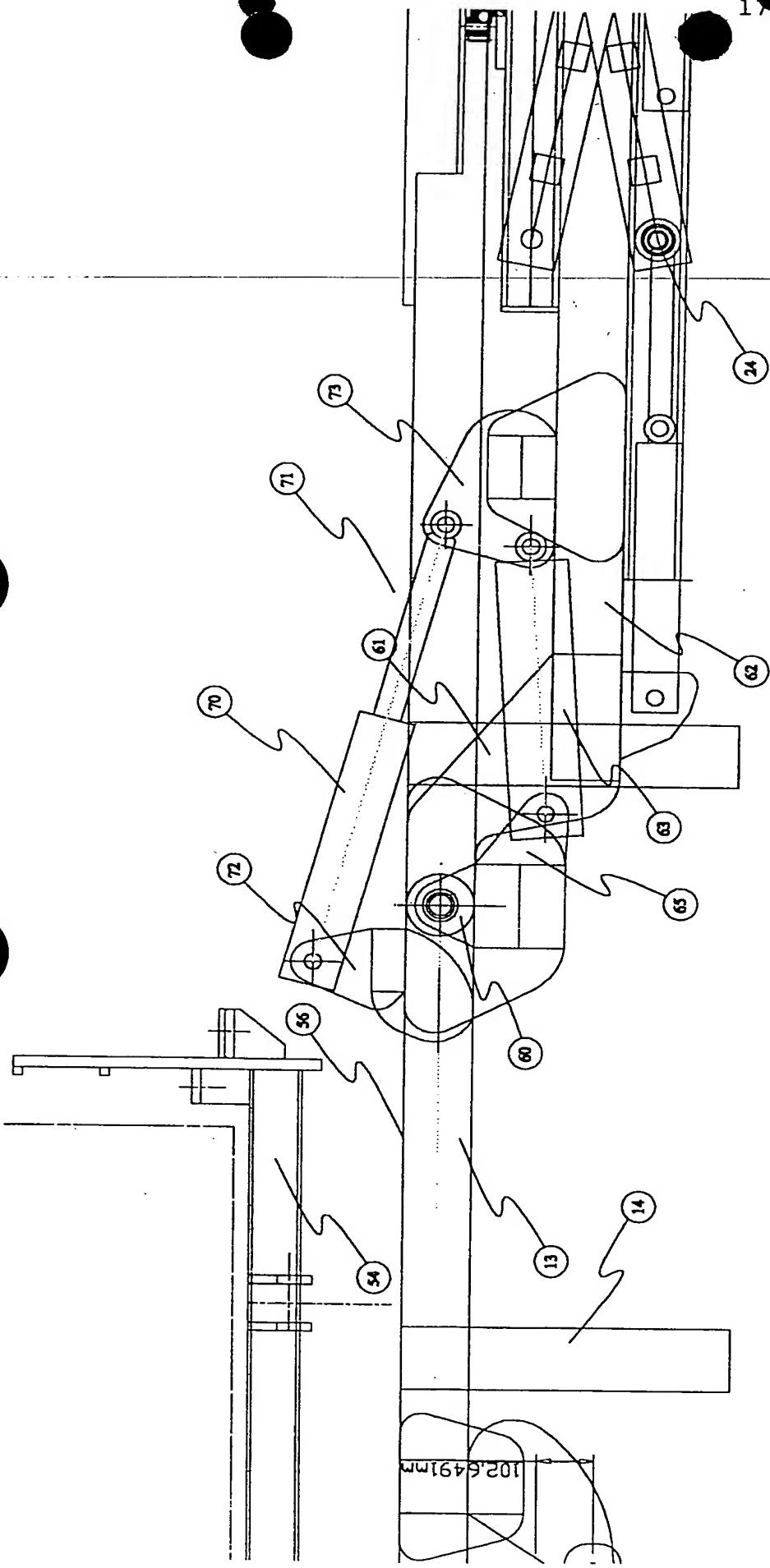
Fig. 15





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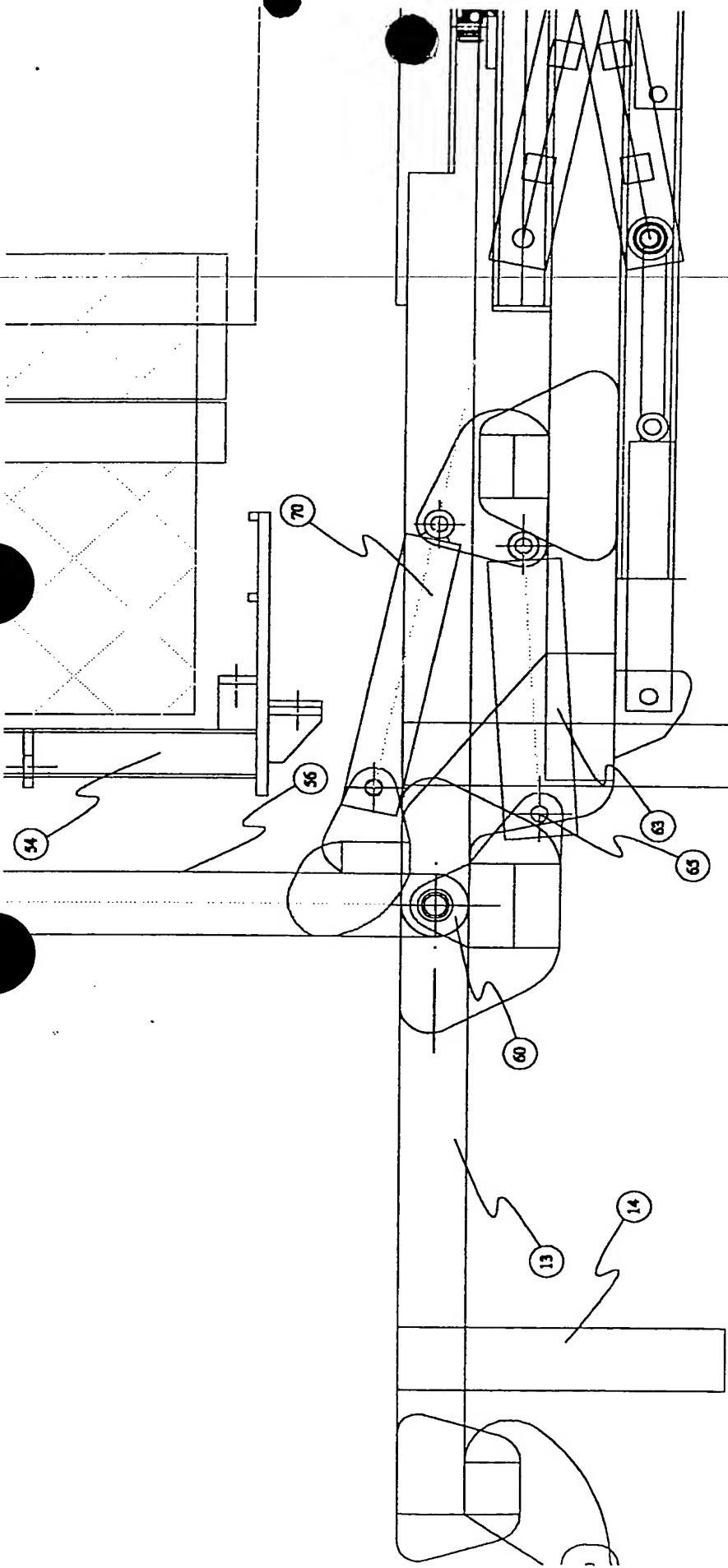
Fig. 17



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Fig. 19

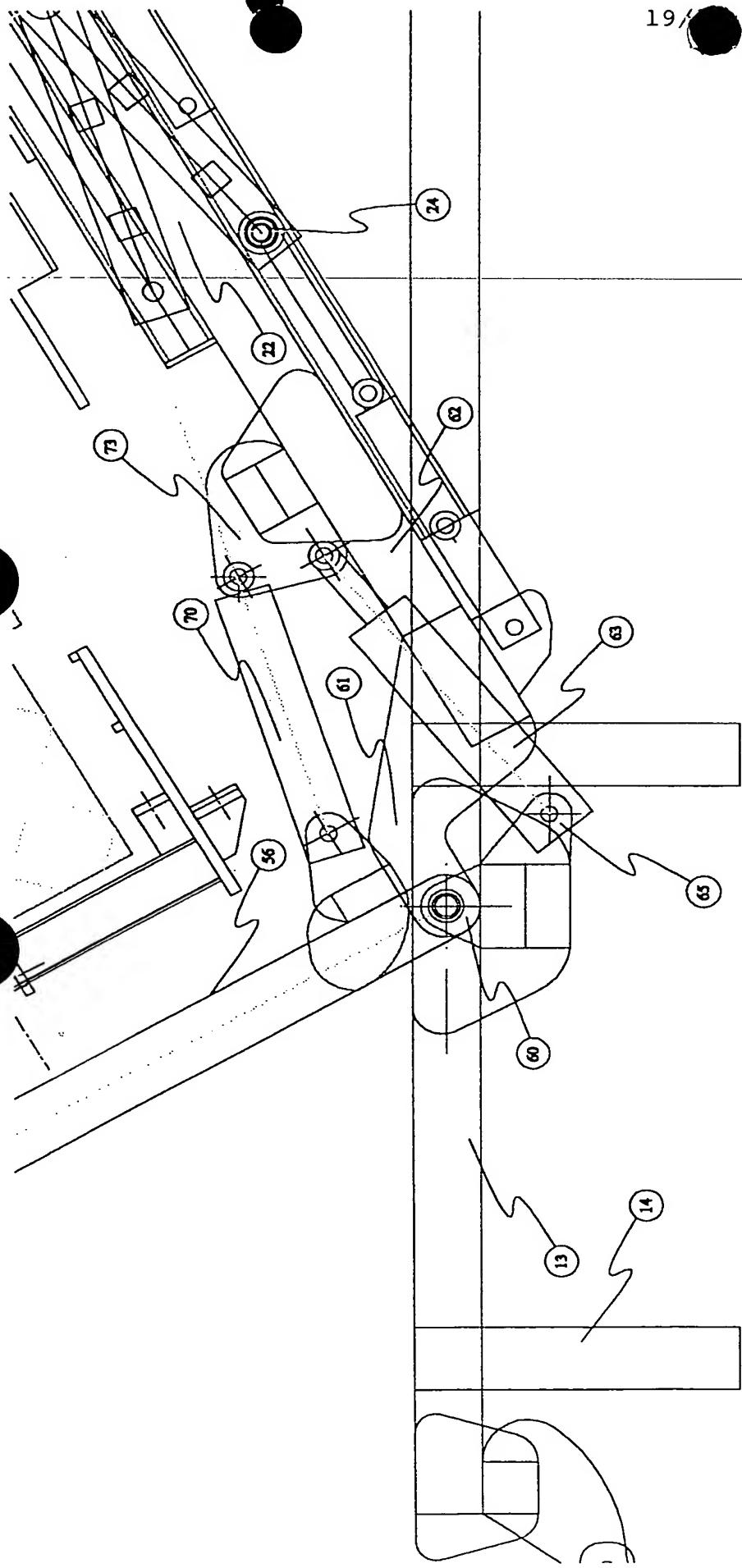


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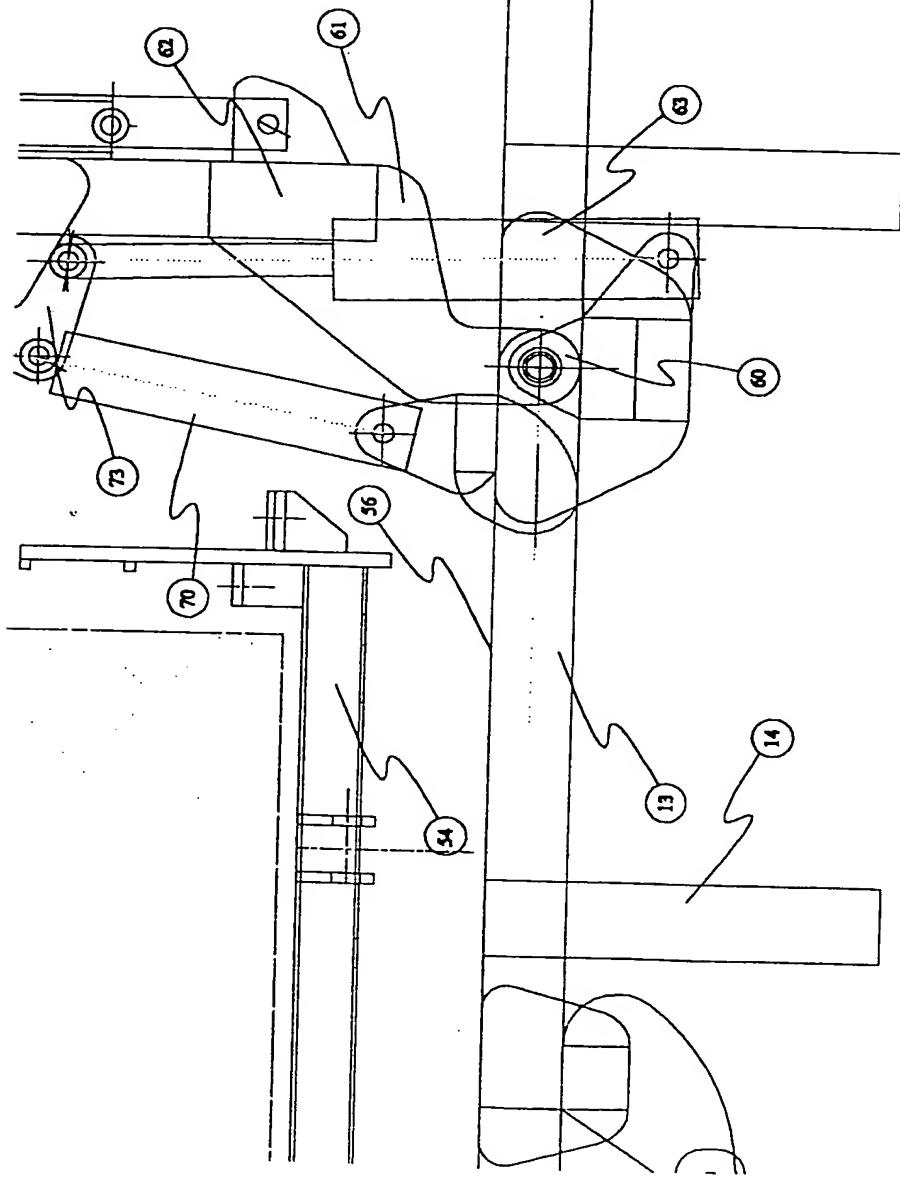


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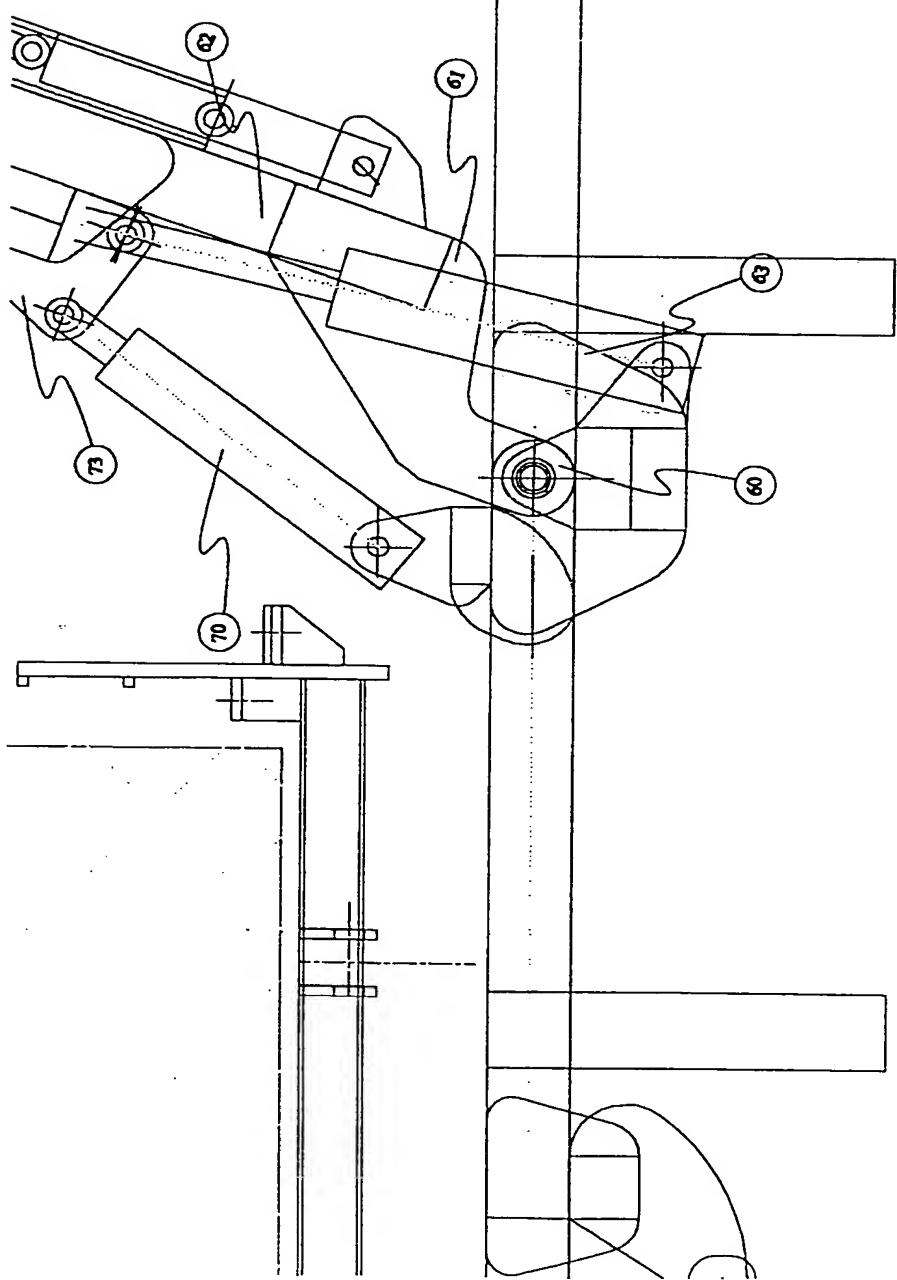


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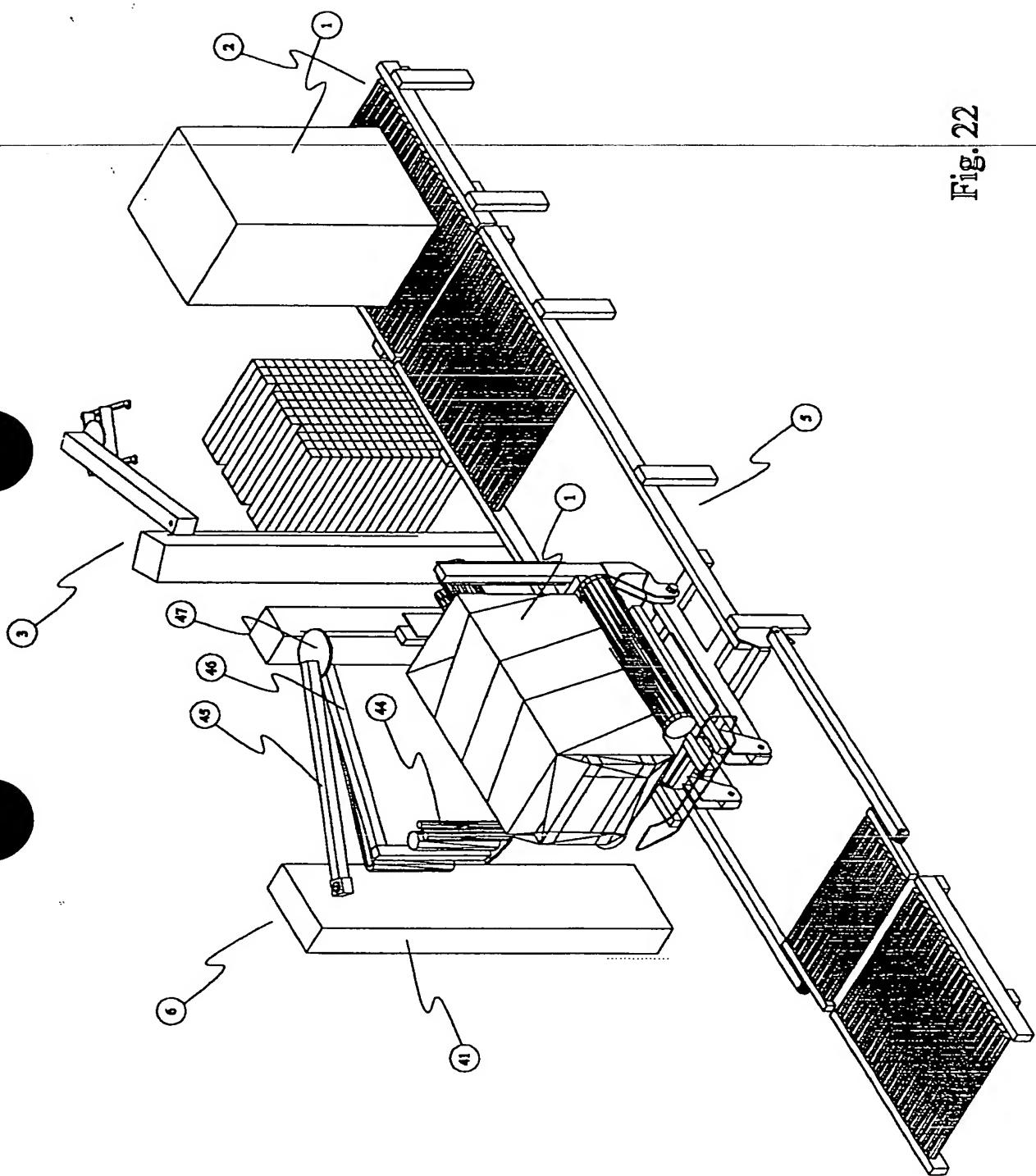
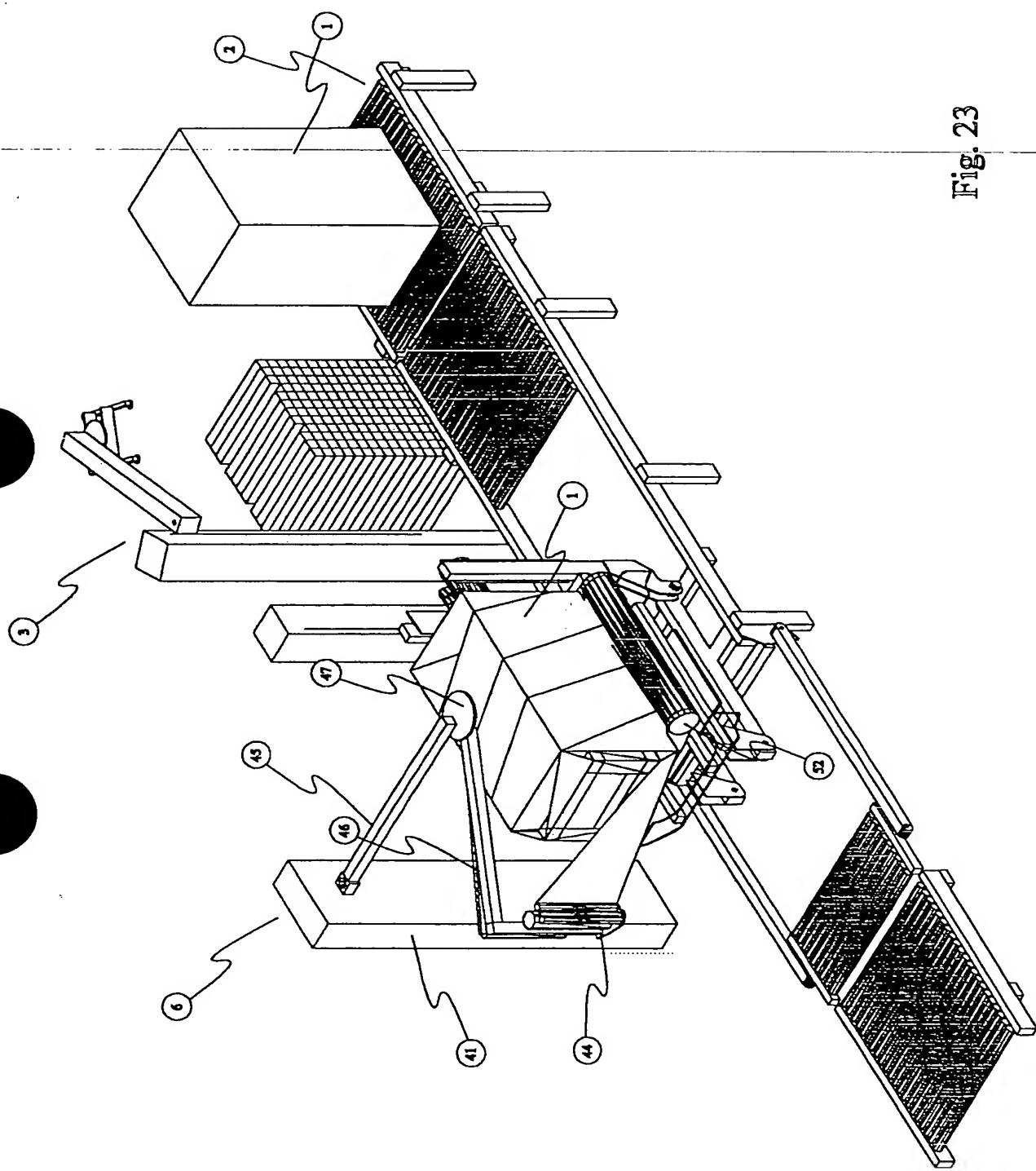


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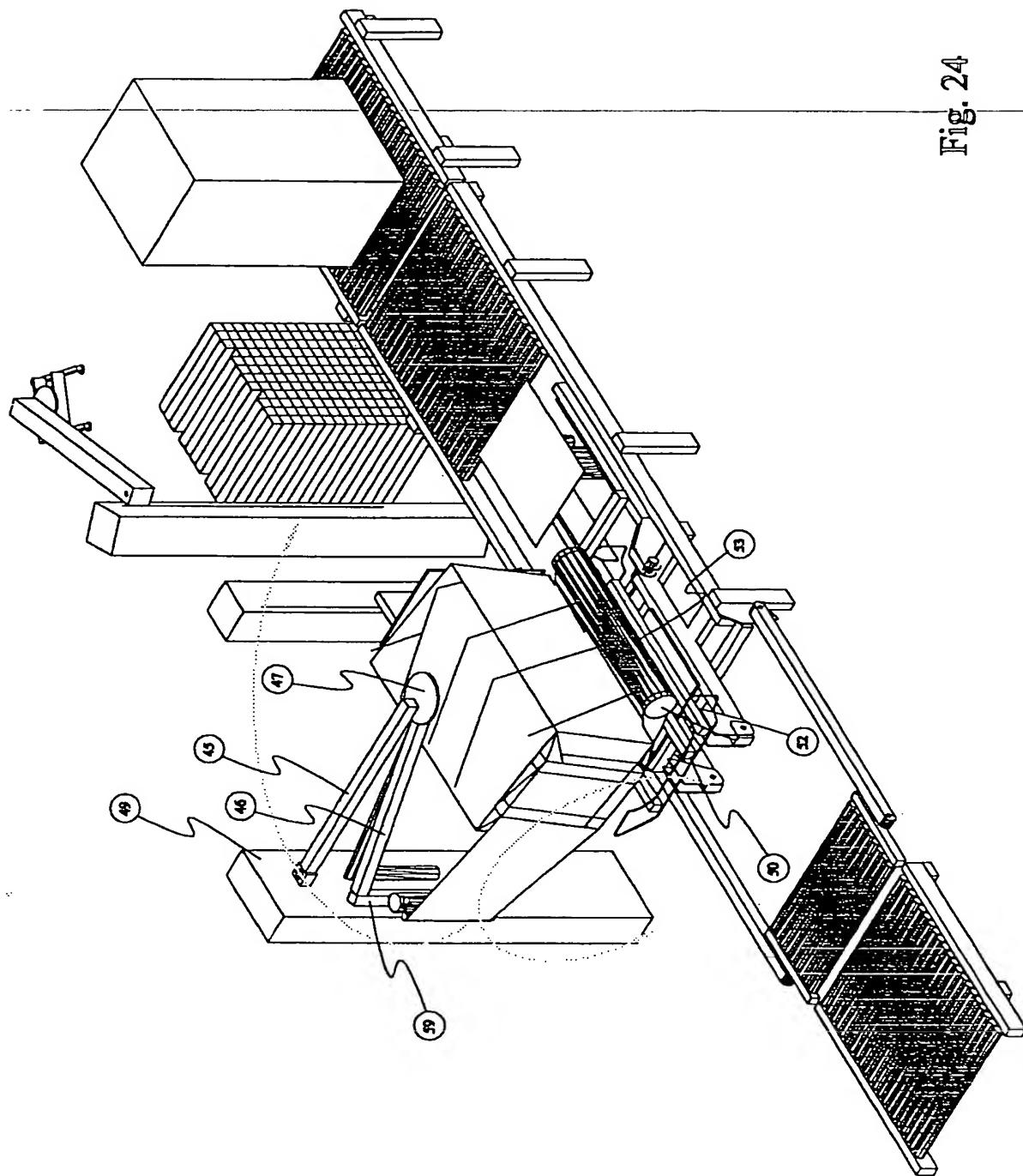


Fig. 24

Fig. 25

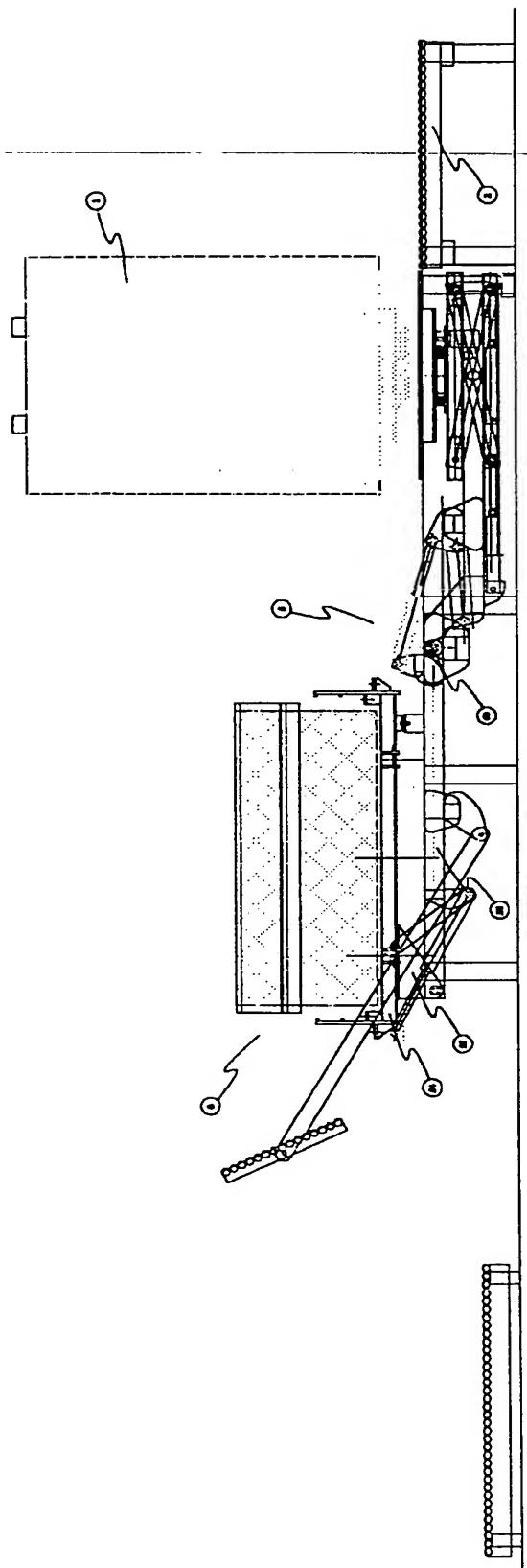


Fig. 26

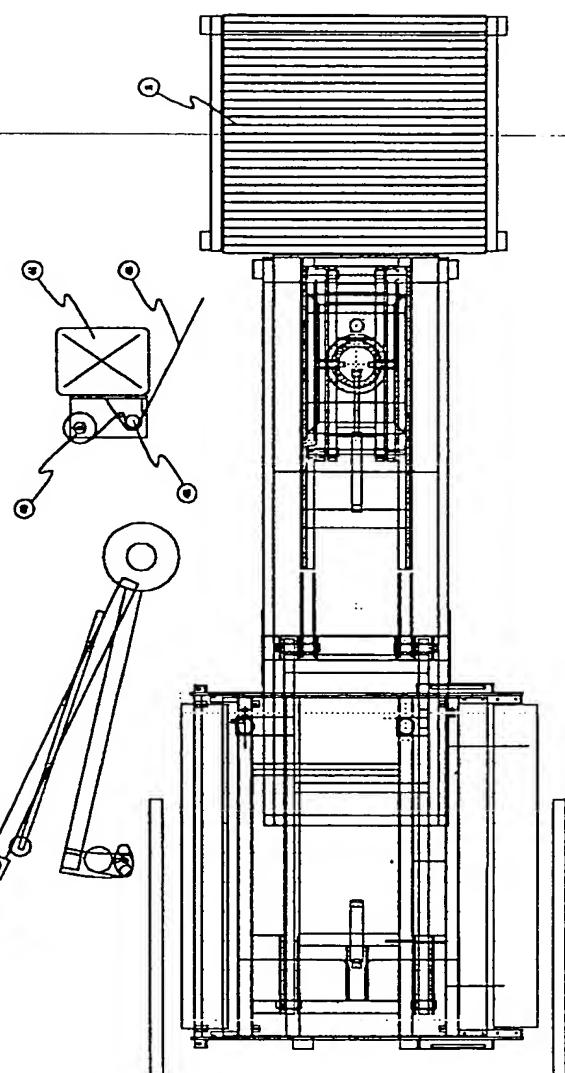


Fig. 27

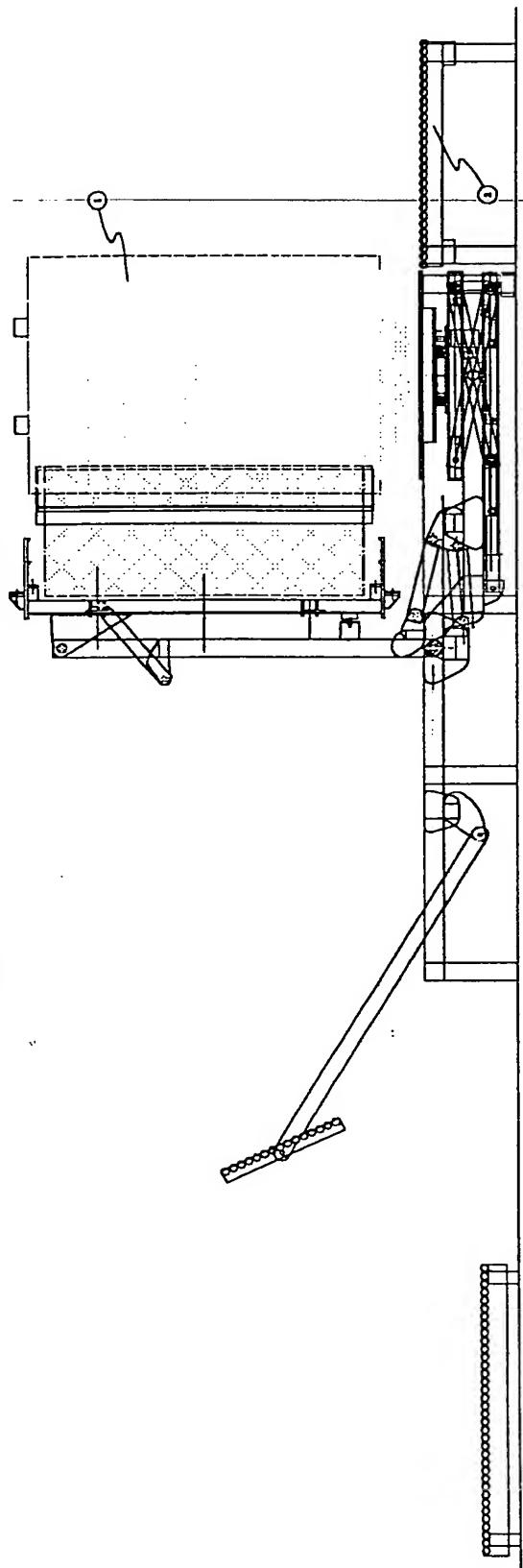


Fig. 28

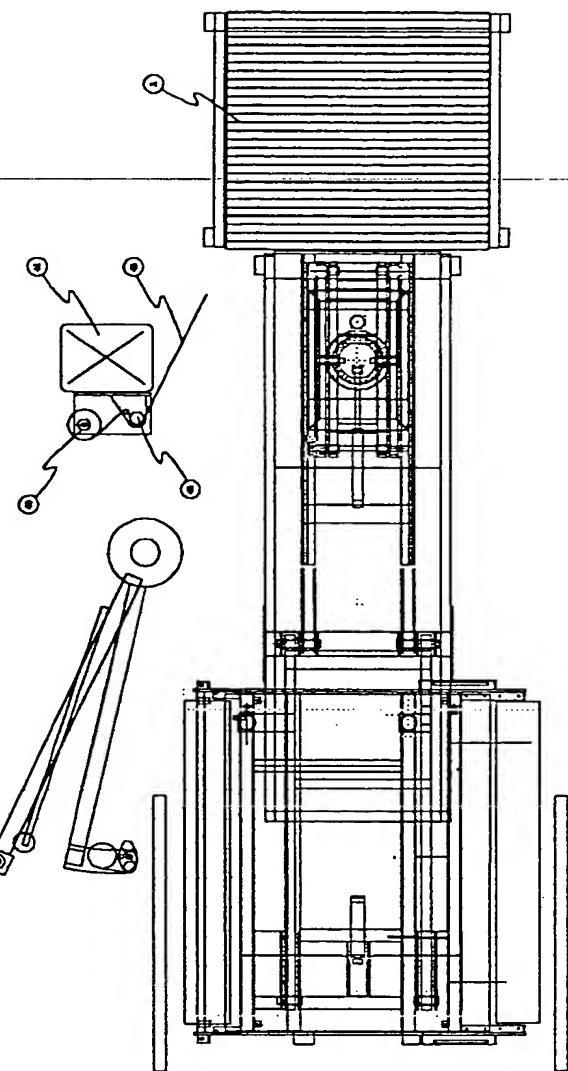


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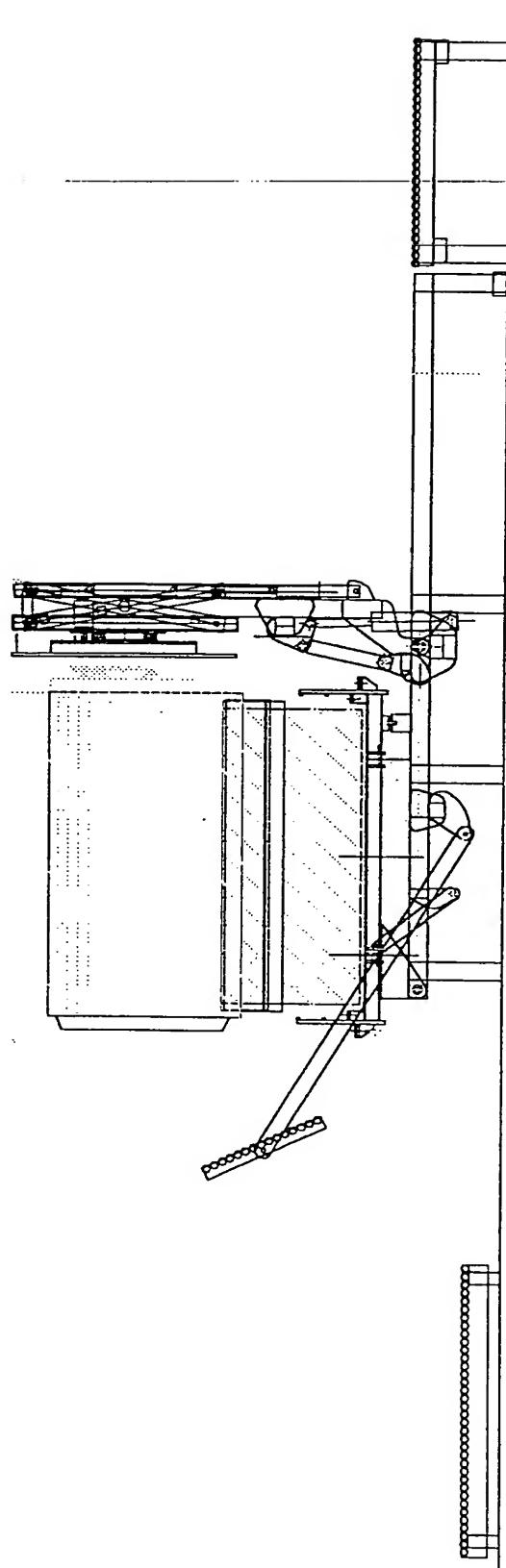
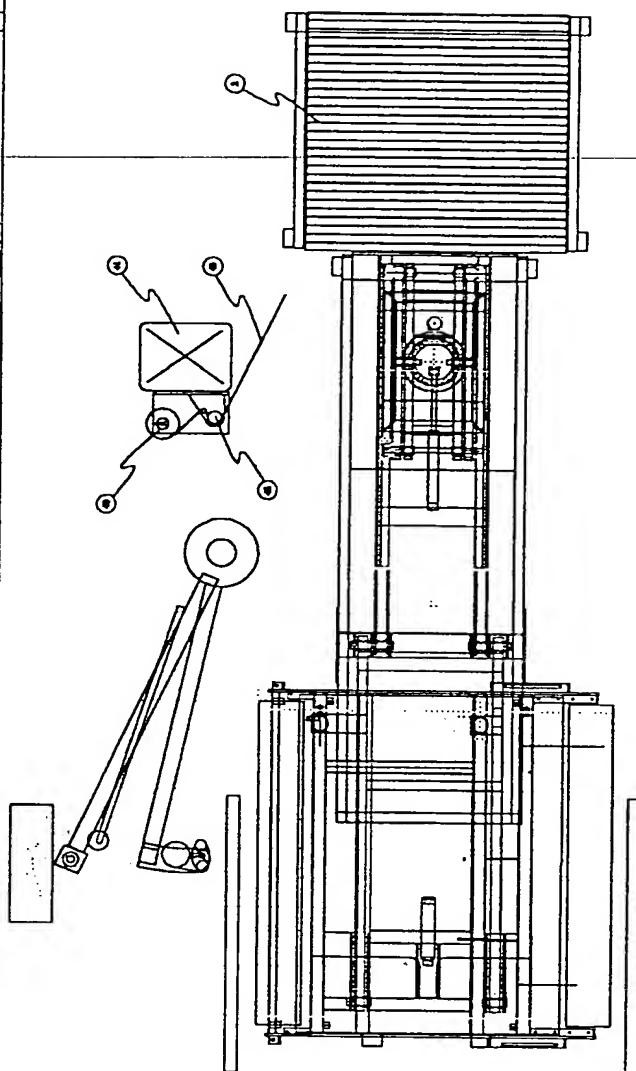


Fig. 30



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Fig. 33

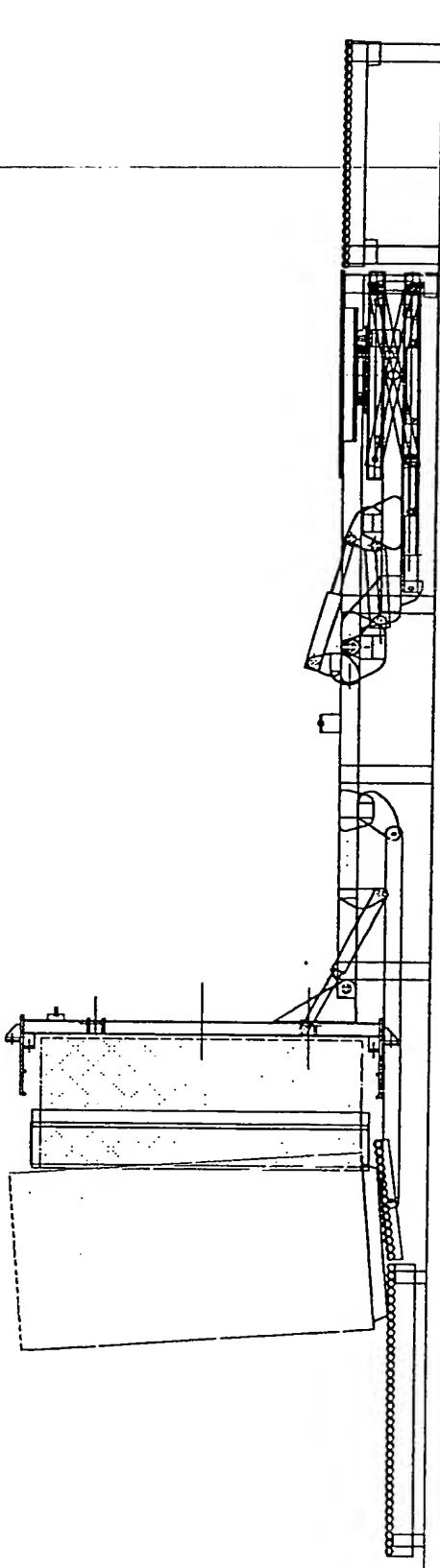


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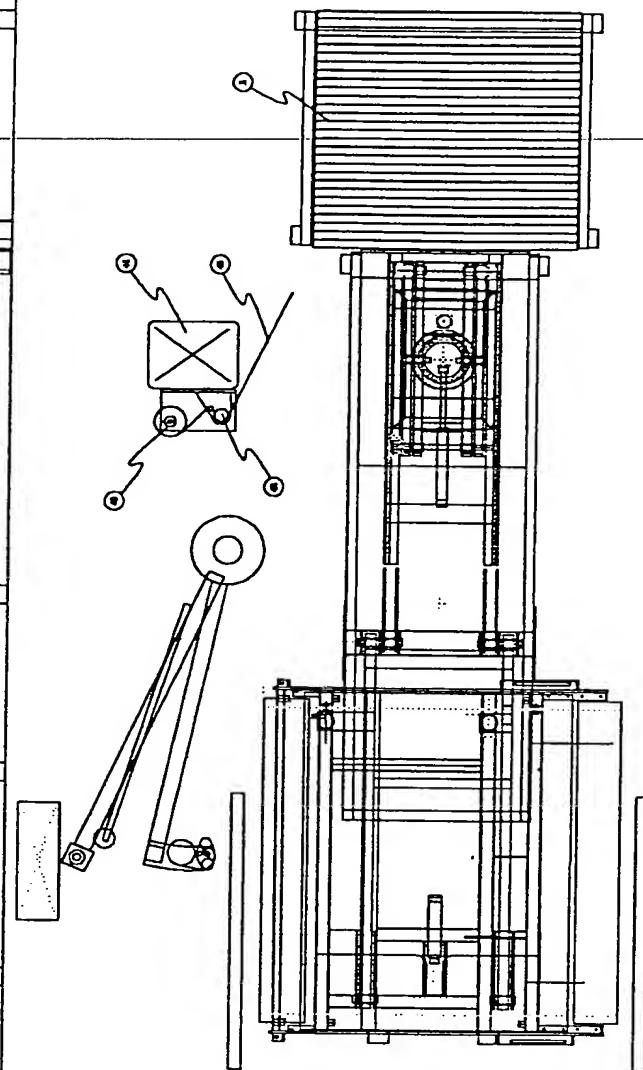


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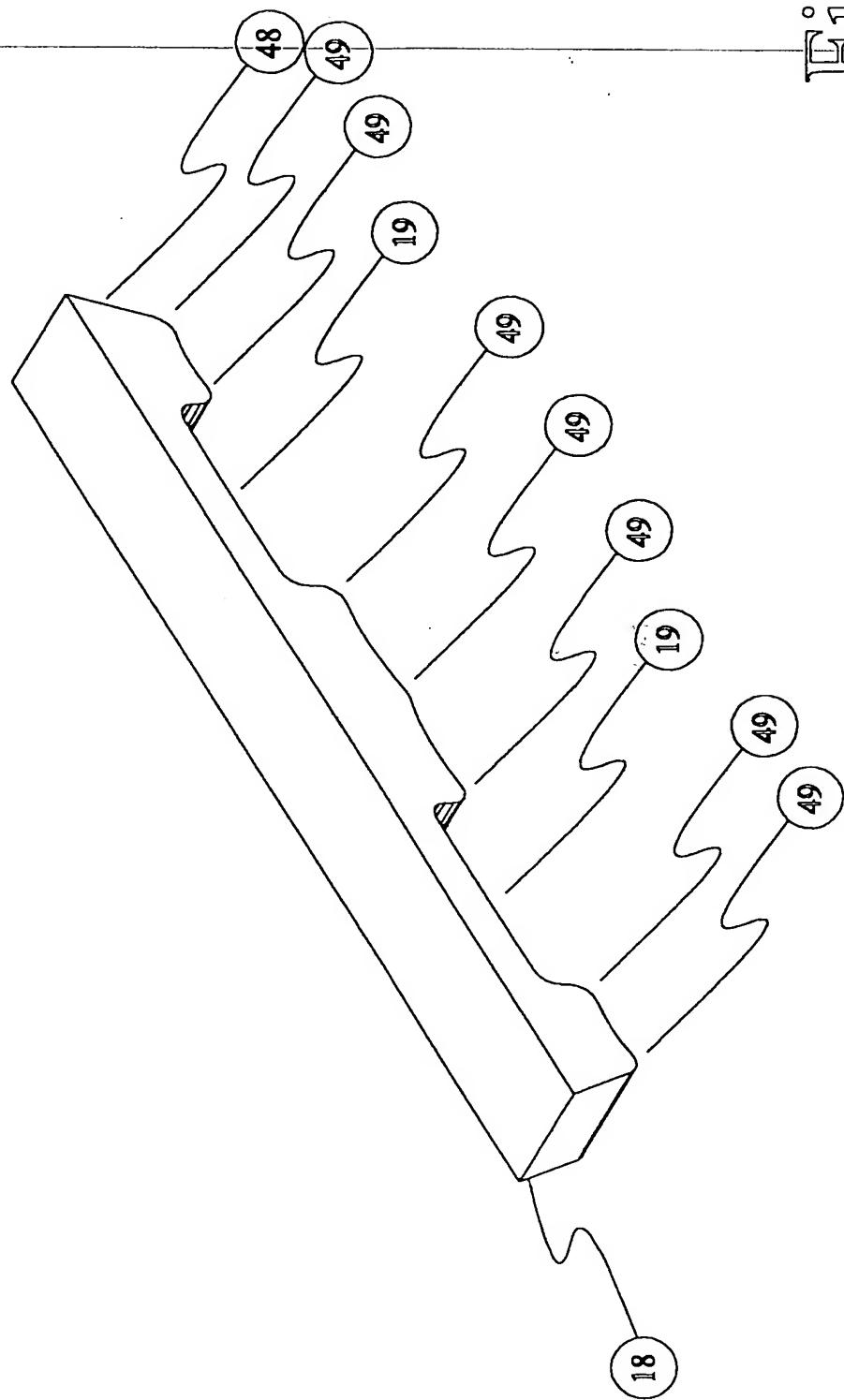


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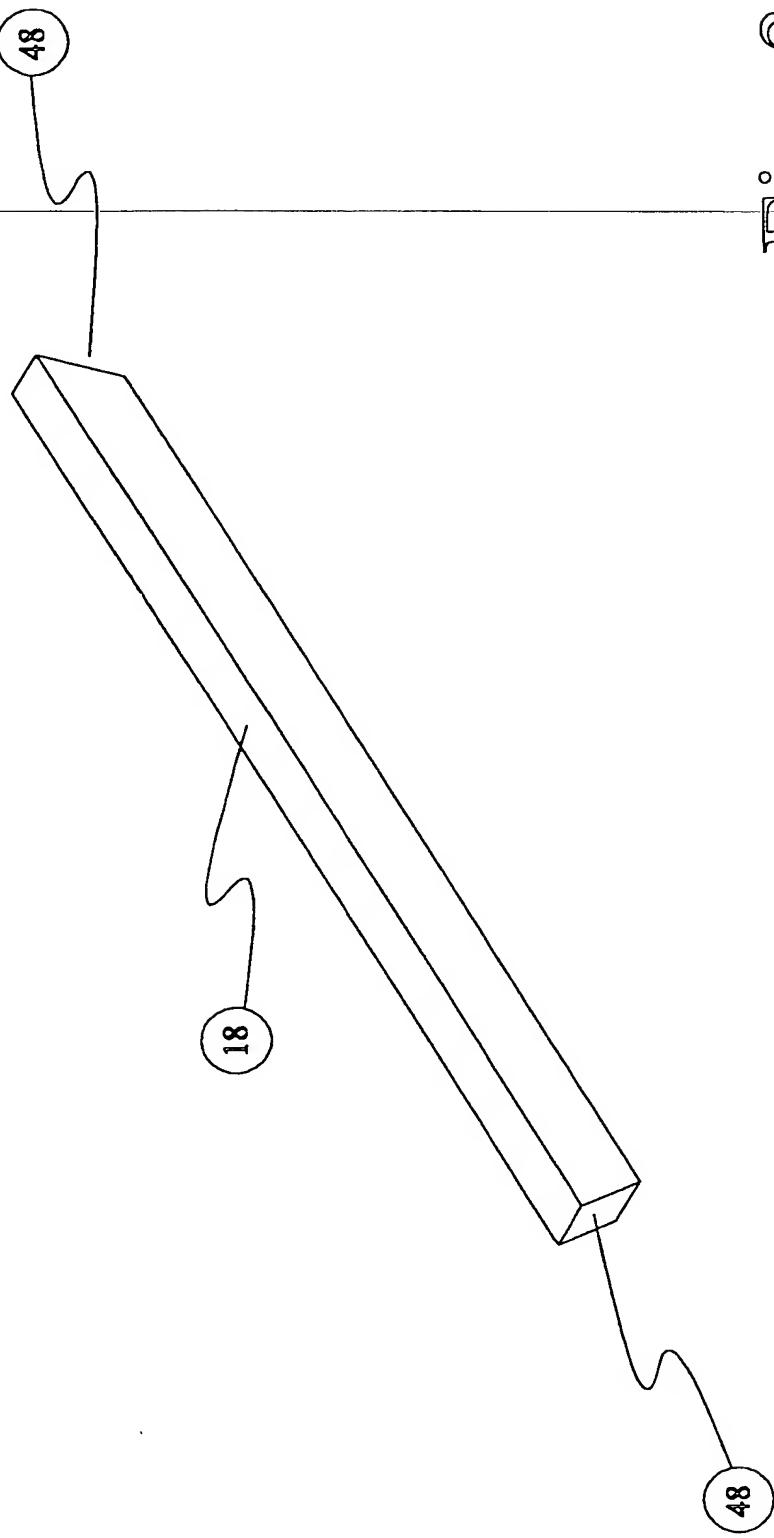


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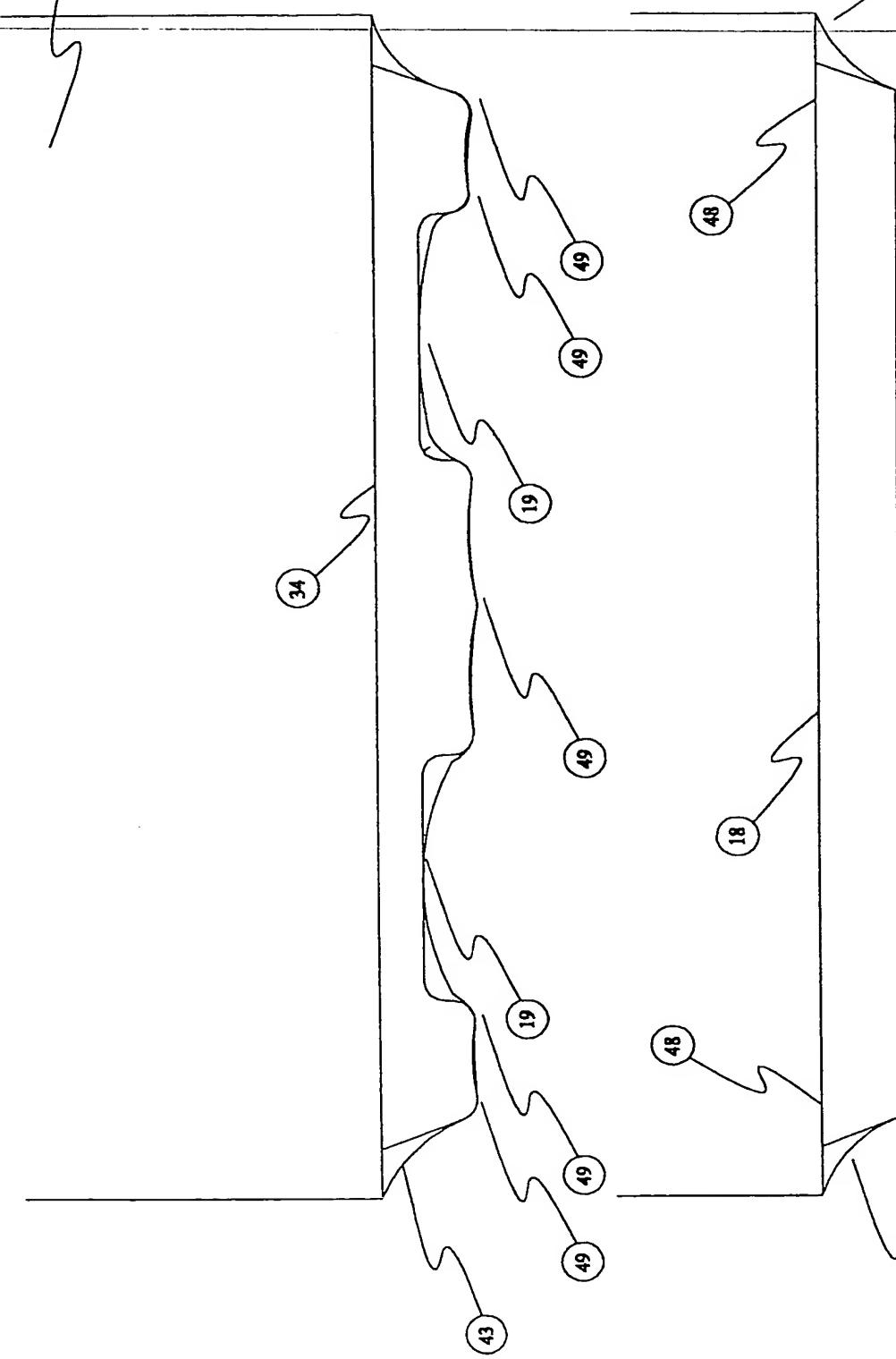


Fig. 38



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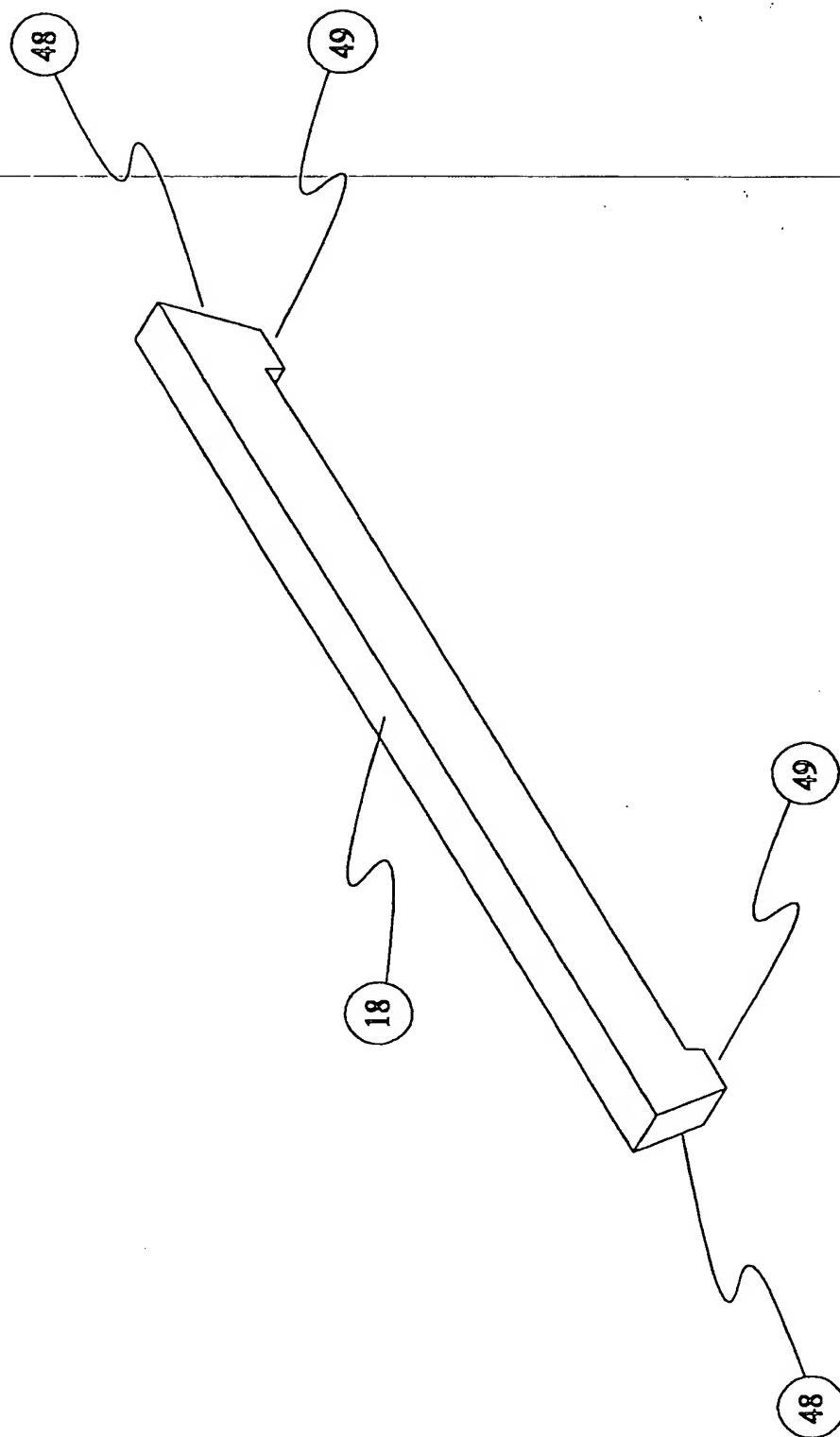


Fig. 39

